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ENGINEERING FINANCE COMMERCE

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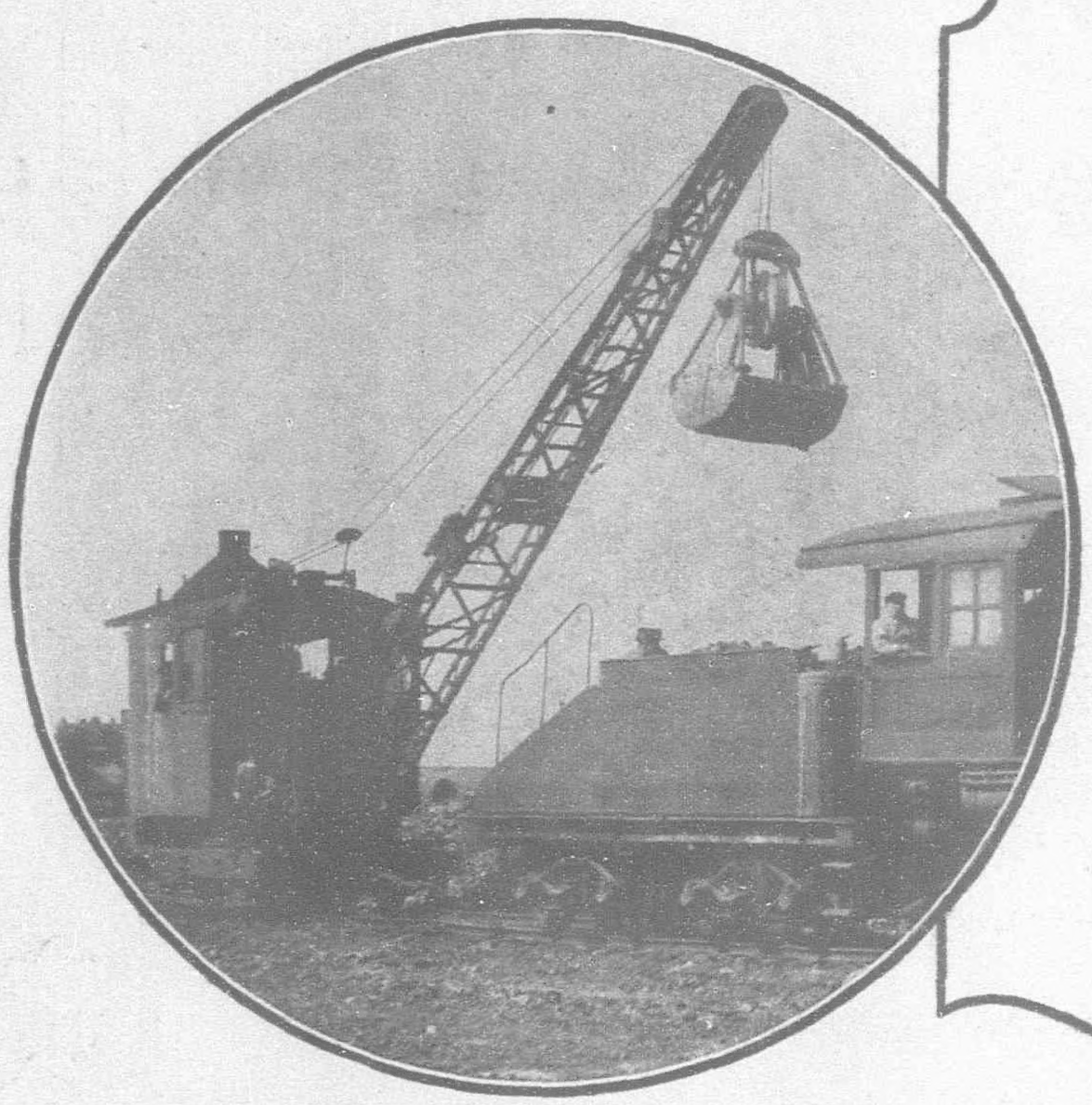

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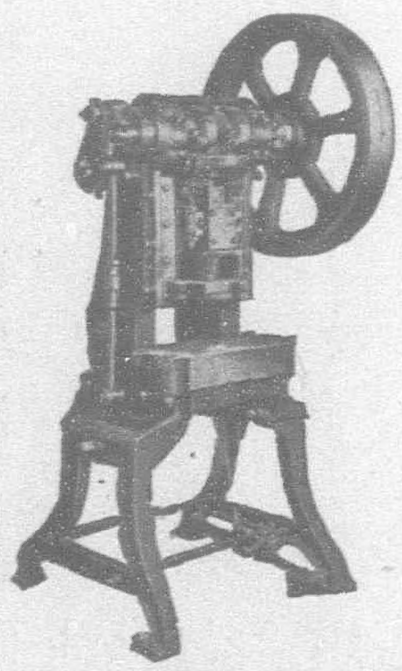

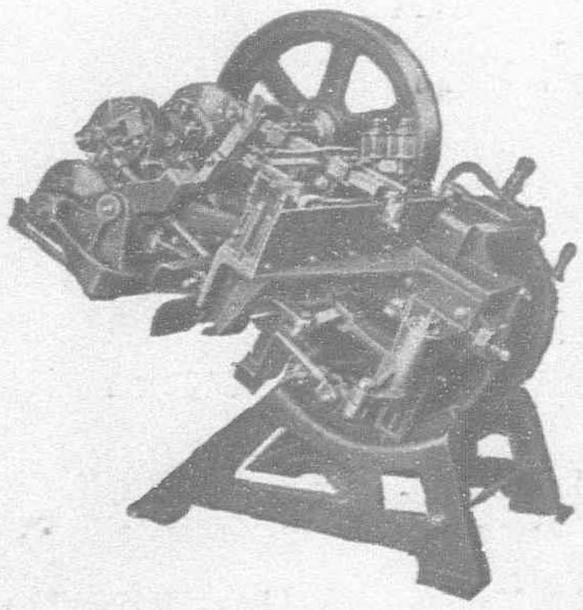

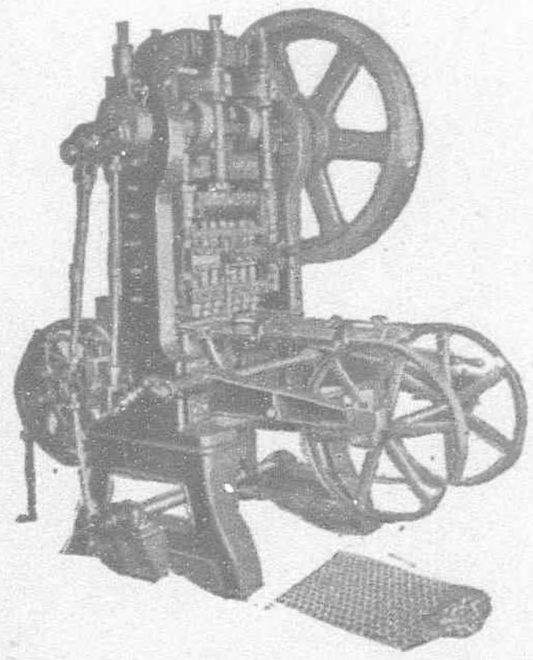

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Dr. JACOB GOULD SCHURMAN
American Ambassador to Germany
From a Sketch by Juel Madsen

The Far Eastern Review

ENGINEERING FINANCE COMMERCE

VOL. XXI SHANGHAI, APRIL, 1925 No. 4

Dr. Jacob Gould Schurman

U. S. Minister to China Appointed Ambassador to Germany after a Laudable Career in China under the Greatest Difficulties

The American Attitude Toward China Unchanged

DR. Jacob Gould Schurman served his term as the American Minister to China during what was undoubtedly the most difficult period for a Peking diplomatic. Everything has been going wrong with China during the past three years, just as everything always goes wrong with any sick man. The fact that a man is sick, however, does not at all mean that he is dead. The capable physician diagnoses the case after a while, discovering wherein lie the dangers to the patient; what are his chances of recovery. To Dr. Schurman, apparently, China has never been without many chances of recovery. He has seen the worst and leaves the country optimistic. It is impossible to believe, in spite of all the enemies of China have to say on the subject, that a man of the training and experience of Dr. Schurman, would be altogether wrong in his analysis of the situation. He has travelled to every part of the country, to the most northern part of Manchuria, to Yunnan, to Szechuan, to interior cities and foreign trading centers ; he passed through Lincheng just after the outrage and when the captives were still on Paotzeku ; he has been through wars and changes of government ; he has seen his own country at the height of popularity ; he has witnessed the growth of an anti-foreign movement. Yet, he is an optimist. Therein, perhaps lies the importance of the man. The unscholared easily grow discouraged, for to them each situation is something absolutely new, something never heard of, never dreamed before. To a man of Dr. Schurman's scholarship, it is all more or less an old story. He has seen it all happen elsewhere, in the ancient world, in the England of the Wars of the Roses, in the Florence of Machiavelli, in the Holy Roman Empire of the Reformation. He knows that nations go through their periods of fever and depression. The strong survive, but national strength lies not in bombast and braggadocio, but in natural resources, man-power, the energy and probity of the people. These China has.

Dr. Schurman has had to face some very serious problems in China. The break-down of governmental authority, the relations between China and Russia, the imposition of illegal taxes were only a few of the many questions requiring a keen understanding of China and of the future of the United States in China.. He had to undo much of the work of some of his predecessors who used the American Legation in Peking as a center of anti-Japanese and at times anti-British propaganda in China. He had to establish sincere friendly relations with all foreigners in China and at the same time maintain the prestige of the United States. He has been a difficult task but one to which Dr. Schurman was equal and which he carried through with unvaried success.

The most unfriendly criticism of Dr. Schurman came from a small but virulent group of Americans who opposed his policy with regard to the future of China. They did not reason as to whether it was a personal policy with Dr. Schurman or whether it emanated from the State Department. They were not concerned with the possibility that the policy might have been the result of an understanding between the American government and other governments interested in China. The fact remains that after the Washington Conference, Japan declared a change of policy which was finally enunciated in Shidehara's speech, parts of which were published in a recent issue of the FAR EASTERN REVIEW. It is interesting that Dr. Schurman's strongest pronouncements on extra-territoriality and China's future, synchronized with similar statements in Tokyo. In a word, the United States and Japan have both adopted a policy of helpfulness to China, of giving China every possible opportunity to end an umbrageous condition, and there can be little doubt but that Great Britain joins in such a policy. The criticism then of Dr. Schurman for his so-called pro-Chinese speeches is specious and poorly thought out. The suggestion that his speeches were scholarly but ill-timed is just so much verbose piffle. The speeches were well-timed ; they were well-planned. They clearly showed to the Chinese people that their future rests, not with Comrade Karakhan, but in the Great Power, the United States, Japan and Great Britain, whose interests in China require a healthy, peaceful China, whose hope for China ultimately is the same as the hope of the Chinese people.

Dr. Schurman leaves behind him in China a host of friends and admirers. He is a worthy successor of such a man as Rockhill. His presence put a period to appointments to Peking of men of questionable competence. His successor, Mr. MacMurray is a trained diplomatic, experienced in the China service, who for several years past has handled Far Eastern affairs in the State Department and who has been an important factor in the organization of the Washington Conference and who will therefore in Peking assist in making realizable its aims.

Japan's Alien Land Law

Legislation to Conform with the Soviet Treaty Clauses Granting Foreigners the Right to Own Land

End of a Troublesome Condition

LAND ownership in any country is a domestic affair and cannot be governed by international agreements altogether, as was evidenced in the California legislation. Public opinion changes and local conditions may develop which require a complete change of attitude on the part of any government toward the question of land-ownership. Orientals were at one time welcome on the Pacific coast, so welcome that a business arose in Canton of kidnapping Chinese for the purpose of bringing them to California. Then the situation in California changed and legislation was passed aimed at keeping Orientals out of the country. Economic conditions governed that change and in spite of every effort of the American Government, anti-Chinese and anti-Japanese legislation stands on the law-books of the Pacific Coast states. Furthermore, these states have been able to use their political influence to put through the Congress of the United States anti-Chinese and anti-Japanese legislation.

Japan naturally enjoys all the rights that the United States enjoys as a sovereign state. If California can prevent Japanese from holding land in California, Japan can pass legislation against Americans holding land in Tokyo or in any other part of Japan. What holds with one holds with the other. The protest then in many quarters against the Japanese law that foreigners may not own land in Japan is untenable, as Japan is completely within her rights to determine such question in any way she pleases. Japan may to-day pass legislation permitting such ownership, but that is no indication that Japan had no right to enact contrary legislation at any other time.

The treaty with Soviet Russia permits Japanese to own land in Russia, in accordance with the laws of that country; it also provides that Russians may own land in Japan, in accordance with the laws of Japan. But there is no Japanese law providing for such ownership. The present legislation is therefore designed to meet the terms of the treaty. But it is clear that there must be reciprocity, that Japan will not permit nationals of a country which excludes Japanese from land-ownership, to own land in Japan. Americans in Asia would like to see the reciprocal features of this treaty so written that only citizens of such states as California, which definitely exclude Japanese from land-ownership, be forbidden to hold land in Japan. But such a condition is a legal absuridity. Since when is the United States an amalgam of States and not a single nation. The Civil War was fought to determine that question and has apparently settled it. In the eyes of Japan, California is part of the United States just as Kobe is a part of Japan or Chihli is a part of China. If California offends, if the United States which offends. If Americans want to own land in Japan, they would be wise to make arrangements for Japanese to own land in California.

The whole situation is explained from a Japanese view point in the following article :—

It is explained that it is not the intention of the government to put the prohibitive provisions of this new law into operation against any American citizens, whether citzens of States having anti-alien land-ownership laws or not, although, through Imperial Rescript, such Americans could be prohibited from land-ownership in Japan.

There will be no move taken, if one be ever taken, to enforce the prohibition upon Any Americans until every opportunity has been given to States having anti-Japanese land laws to repeal these statutes.

The new land-ownership bill was introduced to the House of Peers a few days ago by Mr. Ogawa, Minister for Justice, and was referred by the House to a special investigation committee of seven composed of the following members: Count S. Terajima, Viscount T. Sakai, General K. Oshima, K. Ishihara, C. Mizukami, N. Akaike and Z. Saito.

The law denying to foreigners the right of ownership in land was enacted on January 17, 1873. Until, therefore, a law repealing that statute becomes operative a foreigner is by that law excluded from the enjoyment of full ownership in land which, in Anglo-American law, would be called fee simple (Plein droite de propriete).

Law No. 51 of 1910, which repeals that law, has not yet been put into operation.

There is no legal provision in Japan excluding foreigners from the enjoyment of leases or long leases, such as superficies and emphyteusis. The result is that ever since the whole of the Empire of Japan was opened to the commerce and residence of foreigners in 1899, upon the taking effect of Japan's new set of commercial treaties by which consular jurisdiction of foreign powers was abrogated and the inherent jurisdiction of Japanese courts over foreigners was revived, not only foreign citizens but foreign corporations, both civil and commercial, have permitted to acquire and hold rights in and to land other than full and complete right of ownership.

In Japan there are many registrations in law courts of superficies of 999 years granted to foreigners, their heirs and assignees.

Present Unenforced Law

Article 1 of Law No. 51, promulgated on April 13, 1910, which has not yet been put into operation, provides as follows :

A foreigner having domicile or residence in Japan as well as foreign corporations which have been duly registered in Japan shall be permitted to enjoy full title of ownership in land only in cases where in their own country the subjects of Japan as well as Japanese corporations are permitted to hold land by full title of ownership, provided however that in case a foreign corporation wishes to obtain full right of ownership in land, it must first obtain the permission of the Minister of State for Home Affairs.

" The provisions of the preceding paragraph only apply to the subjects or citizens and corporations of such countries only as may be named specifically in an Imperial Ordinance."

Article 2 of the same law provides :

" No foreigner or foreign corporation shall be permitted to own land by full title of ownership in the following regions :

" 1. Hokkaido (which is generally known in Europe and America as Yezo, which was the old name of the Island, being the most northern of the islands forming Japan proper).

" 2. *Formosa.*

" 3. Saghalin.

" 4. Limited areas necessary for the defence of the Empire.

"The area referred to in alinea 4 shall be determined by Imperial Ordinance."

Article 4 of the same law provides that the date from which this law shall be put into operation shall be determined by Imperial Ordinance and Article 5 declares that Law No. 18 of 1873 is hereby repealed.

Difficult Determination

The Law No. 51 of 1910 has never been put into operation and, in consequence, the Law of 1873, which, according to the law of 1910, is repealed, is still in force.

The reason why Japan has not been able to put the new law of 1910 into effect is found in the practical difficulty of determining what nationals shall be permitted to enjoy the benefit of the new law to the exclusion of others.

As the law regarding the ownership of land by foreigners promulgated on April 13, 1910, was not put in operation, the Imperial Ordinance denying to foreigners the right of ownership in land enacted on January 17, 1873, continued to be in force until quite recently. The Imperial Ordinance under consideration, however, is now being repealed and the following new law is in the Diet instead, to permit foreigners to enjoy the same rights as Japanese subjects in regard to ownership in land exactly on the same footing in accordance with the provision of Article 2 of the Civil Code :

New Law Pending

" Alien Land Ownership Law.

" Article 1. The identical or analogous prohibition or the identical or analogous conditions or restrictions may be imposed by Imperial Ordinance upon foreigners or foreign corporations, that belong to a country that prohibits, or imposes conditions or restrictions upon, the enjoyment of rights pertaining to land by Japanese subjects or corporations, in regard to the enjoyment of their rights pertaining to land in Japan.

" Article 2. Japanese or foreign corporations, more than half of whose partners, shareholders or executive officers, or more than half of whose capital or the majority of whose right of voting belong to the foreigners or foreign corporations specified in the preceding Article, shall be regarded as those of the same country, to which the said foreigners or foreign corporations belong, in accordance with the provision of the Imperial Ordinance, and the provision of the preceding Article shall be applied to them.

Applies to States

" Article 3. In the application of the present law, a part of a foreign country which has a special legislative authority with respect to land shall be regarded as a foreign country.

" Article 4. Prohibition of, or imposition of conditions or restrictions upon, the acquisition of rights in respect to land by foreigners or foreign corporations may be enforced in a district, when it is deemed necessary to do so in relation to the defence of the Empire, by Imperial Ordinance.

" The district provided for in the preceding clause shall be designated by Imperial Ordinance.

" Article 5. The provision of the preceding Article shall be applied to Japanese orporations, more than half of whose partners, shareholders, or executive officers, or more than half of whose capital or the majority of whose right of voting belong to foreigners or foreign corporations.

" Article 6. In case any person, who enjoys his rights in respect to land, becomes ineligible by virtue of the present Law, he shall transfer the rights to other persons within one year.

" Matters necessary for the disposition of the rights in case of the non-execution of the transference thereof specified in the preceding clause shall be determined by Imperial Ordinance.

" The provisions of the preceding two clauses shall be correspondingly applied to a case in which the heir and other general successor of any person, who has the rights pertaining to land, are unable to acquire them. In this case, the period of transference of the rights specified in Clause I shall be extend to three years.

"The period of transference of the rights provided for in Clause I and in the preceding clause shall not be permitted to exceed three years.

Annex

"Article 7. The date of the enforcement of the present Law shall be fixed by Imperial Ordinance.

"Article 8. Special regulations concerning the registration of immevable property incidental to the enforcement of the present Law be shall determined by Imperial Ordinance.

"Article 9. The Proclamation No. 18 of 1873 and the Law No. 51 of 1910 shall be repealed."

Changing Factors in the Economic Life of China

THE United States Department of Commerce has published an interesting Bulletin, (No. 312) on "Changing Factors in the Economic Life of China," by John H. Nelson, Assistant Trade Commissioner. Mr. Nelson has studied his problem very thoroughly and his report contains a large mass of material in a small compass of space on a difficult but very important subject. The conclusions reached are summed up in an introductory paragraph:

From the material presented in this bulletin three important phases of China's present-day economic status are evident: (1) China's foreign trade during the last decade has not increased appreciably in volume, as is shown by a comparative analysis of values with due allowance for price fluctuations and changes in trade channels; (2) the Chinese are developing in a limited way as a commercial and industrial group, securing for themselves increasing participation in the country's foreign and domestic trade; and (3) the economic status of China's rural and agricultural population, constituting about 80 per cent. of the total population, has not improved within the last decade and in many sections has materially declined.

Summing up the situation, Mr. Nelson writes:

A survey of China's Trade as a whole over a long period of time shows no great change by reason of purely domestic causes. It is true that economic development has been hampered and has even retrogressed during the last decade, but nevertheless the remarkable character of the Chinese has enabled the country to emerge from its various disturbances with little or no permanent ill effects from an economic standpoint.

In the period 1897 to 1903, covering those years immediately preceding and those following the Boxer rebellion of 1900, these was a steady and consistent increase in trade, interrupted only temporarily in the year 1900. In 1899 the exports amounted to 195,784,832 Haikwan taels, while the imports totaled 264,748,456. In 1900 the exports dropped to 158,996,752 Haikwan taels, and the imports to 211,070,422. From the period of the Boxer uprising until 1909, while the trade balance remained unfavorable, the total foreign commerce increased appreciably. This indicates favorable development during these comparatively peaceful years. The outbreak of the revolution in 1911 which made China a Republic did not seem to materially affect trade. The total foreign trade of China in 1911 amounted to 848,842,109 Haikwan taels as compared with 843,798,222 in 1910.

In 1917 there was a very serious attempt to overthrow the new Republic. This caused great internal dissension and strife, undoubtedly interfering with regular trade processes, but it is not reflected in the total trade returns of the country, imports advancing from 516,406,995 Haikwan taels in 1916 to 549,518,774 in 1917; and exports registering a slight decline from 481,797,366 in 1916 to 462,931,630 in 1917.

A similar situation confronts China to-day, and we might expect the same trade conditions to prevail. In spite of the greatly unsettled state of the country in 1923, the foreign trade was valued at 1,676,320,303 Haikwan taels, which represents an increase of 76,378,720 taels over the preceding year's total. The point of particular interest here is the fact that China's imports declined by about 22,000,000 taels from the previous year, while exports, which are more immediately dependent on domestic production and transportation facilities, increased by nearly 100,000,000 taels.

Such greatly distorted views of the disturbances in China are circulated abroad, and even commonly accepted in China, that the following comments made recently by the Chinese customs commissioner (British subject) at Shanghai, in his report for 1923, are of particular importance at this time.

"There has not been a time since the outbreak of the revolution in 1911 when the interior was not unsettled. Many of the years between then and the present time (1924) were good years, both from a trade and business point of view . . . . It is then a fair inference that contributory political events and disturbed conditions in China do not affect trade and business as much as supposed . . . .; that there is room for improvement in the present conditions cannot be gainsaid, but that these conditions are the main cause of the business slump is a statement which, in the interests of business and trade alike, it would seem high time to contradict . . . . . Moreover, China is so vast a country that such impediments as civil wars, floods and famines have only a very limited effect on the entrepot trade of Shanghai, which at best taps only an infinitesimal portion of its resources."

A country larger than the United States in area, with probably four times our population, China will always possess large districts and entire Provinces where economic developments can proceed unhampered by internal disorders. A lack of confidence and a general unwillingness to make long-term investments of capital are the specific results of the continual domestic disturbances, both political and military. These disturbances, which are often aggravated by preventable natural occurrences such as floods and famines, make necessary the reallocation of trade routes and conveyances and almost invariably bring about a dislocation of trade. However, business interests in China are prone to charge all their difficulties to the domestic situation and lose sight of factors arising from worldwide conditions such as dislocation of accustomed markets in Europe and Russia, derangements of monetary system in many of these countries, and instability of foreign exchanges in general.

Foreign Trade

The method used in China, and common in most countries of the world, of gauging the course of trade by the total values of imports and exports renders it impossible under the prevailing conditions of price fluctations to judge accurately the progress of trade over a given period, since the quantities, a more reliable basis of comparison, of many commodities are not entered in the statistics.

In order to provide a more accurate foundation for a comparison of the value of China's imports during recent years with those of 1913, the following table has been prepared by the Chinese Maritime Customs, showing the declared values of imports in 1913, 1920, 1921 and 1922 and the values of imports in the three last-named years reconverted on the basis of average 1913 values:

DIRECT IMPORTS FROM FOREIGN COUNTRIES INTO CHINA
[In thousands of haikwan taels]

Groups	Values declared in— 1913	1920	1921	1922	1920 values recalculated at average 1913 values	1921 values recalculated at average 1913 values	1922 values recalculated at average 1913 values
Cotton goods	182,420	246,813	208,663	218,523	127,920	105,110	121,417
Woollen goods	4,880	4,791	7,408	8,794	2,252	2,588	4,369
Metals and minerals ...	29,156	61,572	60,077	49,928	51,199	42,271	46,431
Sundries ...	180,260	261,545	356,279	410,007	158,026	233,336	293,336
Total ...	396,716	574,721	632,427	687,252	339,397	383,305	465,553

The values entered in this table for the first three groups—cotton goods, woolen goods, and metals and minerals—represent the total value of all the items comprising these groups actually recorded in the customs returns as having been imported during the years 1913, 1920, 1921 and 1922. In the case of the fourth

group—sundries—only the values of the more important articles, aggregating some 50 per cent. have been included. The list as it stands deals with about three-fourths of the total direct foreign import trade of China, which is ample for purposes of comparison. Examination of the figures reveals some interesting facts. In the case of cotton goods, for instance, it will be seen that, while the values as declared to the customs in 1921 and 1922 show an important increase over those declared in 1913, the values in both these years, if recalculated on the basis of average 1913 values, record a serious decline and are far below the 1913 total. Values in 1922, however, show a reasonable increase over those of 1921. Recalculated values for woolen goods in 1922 indicate that this group, although not exceeding the 1913 declared values, approaches them very closely and also registers a satisfactory advance over 1921. Metals and minerals, together with sundries, present a different aspect. These two groups both show a considerable advance over the 1913 declared values, thus demonstrating clearly the progress made in these lines during recent years.

It might be well to give here a brief statement of the country's trade balance and a sketch of the background of present-day trade in China. From 1913 to 1923 China's foreign trade has increased from 970,000,000 taels to 1,600,000,000 taels, or 165 per cent. The balance of the trade during the 10 years has been against China on an average of 150,000,000 taels, or about $200,000,000 silver per annum. In 1923 the disparity between exports and imports was 170,000,000 and 305,000,000 taels. In 1919 imports exceeded exports by a margin of only 16,000,000 taels.

In addition to this unfavorable merchandise trade balance should be mentioned the foreign debt service, which for railways amounts to about $50,000,000 and for other obligations about $115,000,000. A further net import of gold and silver bullion, amounting in 1923 to some $60,000,000, adds to China's adverse trade balance. Domestic loans with accrued interest as of June 30, 1924, were $208,400,000 with adequate security and $473,000,000 without security, and the foreign loans amounted to $1,029,000,000 secured and $565,000,000 unsecured, making a total of $2,275,400,000. The combined Chinese and foreign debts, unsecured, the repayment of which is now due, is in excess of $480,000,000.

In addition to the exports, items which tend to reduce the unfavorable balance are remittances from Chinese abroad, estimated to be at least $100,000,000 a year; money required for upkeep of foreign missions, hospitals and schools in China, probably $35,000,000; expenses of foreign legations, consulates, legation guards, expeditionary forces, and naval vessels, and for maintenance and repairs to foreign shipping, about $40,000,000; money brought back by returning emigrants and that spent by tourists, provably $10,000,000. China collects no shipping or insurance profits and no interest on loans to foreign countries. Remittances from its nationals in other countries are the only returns from abroad of this nature.

Analysis of China's import and export trade over a period of years immediately preceding the Boxer rebellion of 1900, through 1923, discloses a general increase in value, volume, and variety of this trade over the entire period, but these are so obviously affected by factors beyond the influence of China's domestic affairs as to afford little more than a basis on which to expend further investigation. That China's domestic as well as foreign trade is more closely linked up with international market factors than is commonly understood, is shown, for example, in the annual report of the customs commissioner in the Hangchow district for 1923. Practically all districts in China report similar conditions with varying degrees of effectiveness. To connect the prosperity of an isolated interior country district of China with conditions in Russia and Europe may seem at first sight a little far-fetched. However, among the factors reported as most intimately affecting conditions in this district are included the closing up of the Siberian routes, the slowness in recovery of sound conditions in European markets after the World War, and the recent disastrous earthquake in Japan. The autumn floods during the previous years had been followed by famine and other forms of suffering, which naturally lessened the purchasing power of the people in this district and reduced their purchases to bare necessaries of life. The cost of living during military operations in this district rose on an average 50 per cent. During the same period conveyance of native produce to various places in the Provinces, both by river and overland, was considerably obstructed. The merchants were chary of laying in winter supplies, while considerable quantities of minerals and rice ready for transportation had to be held back. Heavier taxation and forced contributions aggravated considerably the general financial depression.

Japan and China

IN the course of an interesting article on the "Actualities of China and Her Relations with Japan," Marquis Komura referring to the relations between Japan and China in the *Japan Magazine* writes:

The unsettled political situation in the country is, however, very unhappy for it, and moreover, its economic progress and development is only a question of degree. The settlement of the political situation and the co-operation of the Government and people for the encouragement of trade and industry will quicken that progress and development. The political disturbances have badly affected things in educational, traffic and other directions. They have also had a bad effect on China's relations with foreign countries. At the Washington Conference, for instance, the powers participating in it passed a resolution in favor of the abolition of the extraterritoriality in China in future, to appoint an investigation commission preparatory for it and to convene a special tariff conference in order to effect an increase in the China Customs tariff revenue. But the carrying out of these resolutions has been retarded thus far directly and indirectly by the unsettled political situation in the country. The effect this political situation may work on the Chinese state finances is by no means light when the country is having extreme difficulty in paying the principle and interest of its foreign and domestic loans, which stand at about 2,100,000,000 yen in the aggregate. It is most important that China should be united and her political situation stabilized for the benefit of herself and also for the sake of the world's peace, and it is to be most earnestly hoped that it will be realized at the soonest possible date.

Japan is small in area but comparatively large in population, which is increasing about 650,000 a year on an average. Moreover, this is unfortunately short of a domestic supply of natural products, the yield of rice, which is her most important food, even falling under the demand by about 4,000,000 *koku* a year. In the direction of food, clothing and habitation, too, she is far from being self-supporting. In the circumstances, she has to get a large quantity of commodities from foreign lands to make up for the shortage. Her big neighbor, China, is nearly 25 times as large as Japan in area, and is rich in natural products. The best way for the future of Japan would, therefore, be to get a great variety of raw materials from that country by means of a true understanding of the Chinese Government and people, making the best use of our industrial development towards the goal of the establishment of our country on an industrial basis. The average yearly amount of Japanese products exported to China in the past three years was something like 400,000,000 yen in value, 27 per cent. of Japan's total export trade, while the average yearly volume of Chinese products imported into Japan in the same period was about 310,000,000 yen in value, sharing 15 per cent. of Japan's total import trade. From this it may be clearly understood that the two countries are in very close economic relations and must be brought into closer touch. It is regrettable, however, that while it is so important to bring about a better economic approachement between the two countries, it is felt that the two countries have not been able to sufficiently join hands in the promotion of their mutual economic interests. There are different historical and political causes for this. The Japanese people must make a point of meeting and dealing with the Chinese people with sincerity and without discrimination, with a view to benefitting themselves as well as the Chinese; and especially, those Japanese, who personally take active interest in the economic world of China, must always bear in mind that they must profit the Chinese, the owners of the land, at first and then profit themselves; otherwise it will be impossible for us to work economically in concert with China, advantageously and truly. As we must not be aggressive politically so we should not be invasive economically. We must foster a common existence and common prosperity. Essentially, the two people must thoroughly understand each other's standpoint, interests and sentiment, and respect each other.

The Yokohama Specie Bank and the China Trade

MR. Kenji Kodama, President of the Yokohama Specie Bank, in a brilliant survey of world trade in the course of his annual address on March 10, made a reference to China and Manchuria which summarizes the position of foreign trade in China and shows the effects of the country's disorders on its prosperity. We reprint from Mr. Kodama's address those parts which refer to Japan and China :

Mr. Kodama said : " In the period under review our economic world was still in what has become known as the " Readjustment Stage " and was unable to free itself completely from depression. Moreover, an adverse trade balance was reflected in foreign exchange, which recorded an unprecedented fall, and this fall, high prices and the embargo on the export of gold were the subjects of nation-wide discussion during the half-year. It was ultimately decided that the restoration of economic power by the co-operation of the whole nation was of fundamental importance if adverse factors were to be eliminated, and the government set an example by carrying out in earnest plans for readjustment and retrenchment in connection with administration and finance. Some public work was suspended or postponed, while a non-borrowing policy and enhanced import duties on luxurious goods were determined upon, and by these means the restoration of the nation's confidence was greatly assisted. The general public followed the government's example, and the spirit of thrift and of hard work became increasingly noticeable, which is a good augury for the recovery of the country's economic position.

For the purpose of comparing the chief statistical items with those of a previous corresponding half-year, it seems better to avoid using the figures for the second half of 1923, as that period was so greatly affected by the earthquake disaster, and the figures for the corresponding half of 1922 have therefore been chosen for the comparison. On the one hand, this comparison shows that the index of wholesale prices rose 8 points to 218, and that the total Bank clearings for the whole country increased by Y.2,759,000,000 to Y.38,878,000,000, an apparent indication of better times in business circles, but, on the other, that new capital issues for business enterprises decreased by Y.111,000,000 to Y.488,000,000, and that the stock of merchandise stored in the country's warehouses at the end of the half-year had decreased by 3,600,000 pieces with a total of 19,990,000, and these latter figures clearly indicate the depression in business. Money was easy during the period, to which condition the non-borrowing policy of the government, the influx of the proceeds of foreign loans and the repayment of the French Yen loan all contributed, as did also the fact that the bulk of the money realized from debenture loans, amounting to Y.400,000,000, was utilized for the liquidation of old debts. Rates showing a downward tendency, the payment of the first instalment for " destroyed silk," which had been looked forward to not without anxiety, was effected quietly. Towards the close, the Bank of Japan's advances increased until they exceeded Y.760,000,000, due to requirements for settlements at the end of the year, but even so Call Money remained easier than in the previous year.

Turning our attention to foreign trade, exports and imports for the half-year amounted to Y.999,000,000 and Y.981,000,000, respectively, showing only the small excess of Y.18,000,000 of exports over imports for a period when a much more favorable trade balance is usually expected. If the trade figures of Chosen and Taiwan be added to those of Japan proper, an adverse balance of Y.722,000,000 for the whole of 1924 is shown, or an increase of Y.115,000,000 over the previous highest adverse balance of Y.607,000,000, which occurred in 1923. Let us now examine more particularly trade conditions. By the beginning of the period, imports of emergency goods had almost ended, while exports of raw silk and cotton goods, encouraged by the fall of the Yen, had become active. August witnessed a steady improvement in trade conditions, and the excess of exports over imports gradually increased. In September, however, a sudden setback occurred, due to the disturbance which abruptly broke out in China and which greatly interfered with our trade with that country, and although our exports of raw silk increased in volume, the amount realized on them did not increase in proportion, owing to low prices. On the other hand, imports of cotton from America were of quite good amount, despite the unfavorable exchange position, and as a consequence the favorable state of trade terminated in October, and in November an adverse balance was again in evidence and remained so to the end. Our trade position was unfavorable as regards twenty-four foreign countries and favorable as against sixteen, Great Britain occupying the premier position among the former, our excess of imports from her amounting to Y.110,000,000. Then follow Germany, British India, Kwangtung Province, Dutch East Indies and Switzerland with Y.62,000,000, Y.42,000,000, Y.22,000,000, Y.22,000,000 and Y.11,000,000, respectively. America heads the list of the countries with whom we had an excess of exports, in her case to the extent of Y.218,000,000, while Hongkong, China and France follow with Y.41,000,000, Y.31,000,000 and Y.26,000,000, respectively.

Our foreign exchange, which had kept steady at the rate of 41 on America during the first half of the period, when over-exports were in evidence, became weak in October, when trade began to assume an adverse condition, and broke to under 40, dropping quickly thereafter to as low as 38½, and its maintenance at that figure even was often threatened. The beginning of November, however, saw a better position, and the rate remained at 38½ until the end of the year. Exchange on England, besides being influenced by the fall in exchange on America, was also affected by the improvement in Sterling, and experienced a steady drop from 1s./11d. at the beginning to 1s./7½d. at the end of the period. As to Silver exchanges, let us first examine the position regarding Silver itself during the half-year. It opened at 34¼d. and fluctuated within small limits with 34d. as the centre. In September, the monsoon in India was reported as satisfactory, and the subsequent increase in purchases from that country, together with a Continental demand for coinage purposes, sent the rate up until on October 9th it had reached 36 1/16d., the highest price during the period. About this time, however, Continental buyers retired from the market, and although India still remained a purchaser, she could not check the influence of China, who at this time came out as a strong seller. Towards the end of October, therefore, the rate fell to 34¾d. and to 33d. in November. The recovery of Sterling was a factor in a further drop in Silver, which at the end of the period had reached 31 5/16d. with a weak undertone prevailing. Exchange on Shanghai commenced at Taels 57¾, but, despite the lower price of Silver, the rate gradually dropped as the result of the fall in Japanese-English Exchange. The rise in Silver from September helped to cause a further decline, and Taels 46½ was recorded on October 10th. Any additional drop was checked by the fall in the price of Silver, and the rate eventually recovered to over Taels 49. Afterwards, the effect of any fall in the Japanese-English exchange was counterbalanced by a drop in the price of Silver, and so exchange on Shanghai continued at about Taels 49 until the end of the half-year.

" Turning our attention next to China, at the beginning of the period a good foreign trade was thought to be in prospect for that country as the result of the more stabilized political and economic condition of Europe, but this anticipation was not realized. The disastrous floods in North China, which lasted for over a month and a half ; the unsettled political conditions in South China, with Canton as the centre ; the war between Chekiang and Kiangsu, quickly followed by another between Fengtien and Chihli ; all these troubles occurred successively and extended over about four months. Communications and transportation in the interior were thrown into disorder, which greatly hampered the movements of goods for export, and as this in turn reduced the purchasing power of the people in the affected districts, the import trade also suffered. At Shanghai, however, the exports of raw silk to Europe, India and the United States amounted in the aggregate to 51,000 bales valued at Taels 16,850,000, which figures are about two and a half times those for the corresponding period of the previous year, while the exports of cotton to Japan, due to the high price of the American product on the one hand and the delay in the movement of the Indian on the

other, also showed a large increase, the total value being Y.27,000,000 or about double that for the corresponding half of the year before. Except for these two items, exports were unsatisfactory, those of green and black teas being 20 per cent. less than in the previous year, while peanuts from Shantung and sesame seeds and beans from Hankow showed smaller shipments than a year ago. As regards imports, except for cotton from the United States and India, which totalled as much as 73,000 bales in all, there was a marked decrease in flour from America, and also in cotton goods, woollen goods and hardware from Great Britain, while wines from France continued indifferent. The imports of our cotton piece goods were, however, quite good, amounting to the satisfactory figure of 82,000 bales, valued at Y.36,000,000, or 14 per cent. more than a year ago. This good result is due no doubt to the favourable position for importing created by the depreciation of the Yen, and also to the absence of any boycott movement against our goods during the period. At Hongkong, trade with Yunnan, Tonkin and French Indo-China through Haiphon was good at the beginning, but, on the other hand, trade in Canton and district was in a depressed condition, with large quantities of all sorts of merchandise in stock. Consequently, imports by Hongkong of our cotton piece goods, which, encouraged by the fall in the Yen, had been very active at the commencement, became less lively from the middle of the period onward, while the import trade in other goods was also in a very depressed state. Exports were in general far from satisfactory, but shipments of raw silk from Canton, despite the disturbed conditions in that quarter, recorded as large a total as in 1923, and 11,000 bales and 13,700 bales were sent to France and America respectively. However, although the quantity of raw silk shipped was the same as in the previous year, the value did not correspond, being 33,770,000 Hongkong Dollars, or a decrease of 11,500,000 Hongkong Dollars.

At the commencement, money was easy, but about the middle of August, when an outbreak of war between Chekiang and Kiangsu was considered inevitable, money rapidly became tight in Shanghai and some native banks there went bankrupt, with the result that the rate was over 25 per cent. p.a. at one time. However, by the combined action of the Hongkong Bank, the Chartered Bank and our own the situation was relieved before it had become too critical, and money flowing in from outside in September provided further relief. Every precaution was taken by the banks when war between Fengtien and Chihli appeared imminent, and money became gradually easier and remained so until the demands in connection with Chinese New Year requirements commenced towards the end of the year.

Exchange fluctuated in general in agreement with Silver. For instance, take the Shanghai exchange on London, which rose from 3s./3¼d. at the beginning of July to 3s./3¾d. at the end of the month. Later, through the fall in Silver, caused by the recovery in Anglo-American exchange, it became weak, dropping as low as 3s./3d. in the middle of August. The prospect about this time of an imminent outbreak of war between Chekiang and Kiangsu again sent the rate up, and the end of August saw it at 3s./3¾d. In September it rose further to over 3s./5d., but as the Chekiang army was defeated about then and its General, Lu Yung-hsiang, fled to Shanghai, this was taken as presaging an early end to disturbances, and buyers of exchange came forward, causing the rate to fall under 3s./4d. Afterwards, owing to India's large purchases of Silver, and also to the outbreak of war between Fengtien and Chihli, the price of Silver again became firmer, pushing up the exchange in turn, so that by the end of September it was over 3s./5d. Later, it took a further upward movement, and after a slight setback reached the highest point in the period when it touched 3s./6¾d. on October 9. On October 13, however, Lu Yung-hsiang fled to Japan, and on the 21st of the same month Wu Pei-fu fled from his headquarters, and both these events were considered as indications of the cessation of the civil war in the near future. Accordingly, from the middle of October, exchange weakened very much, and at the beginning of November was quoted at 3s./4¾d. It had dropped to 3s./3 1/16d. by the end of that month, while December 18 saw a further fall to 3s./2⅛d. and by the end of the year it was 3s./1⅝d.

Finally let us investigate conditions in the Manchurian area. At the beginning of the period the financial situation in Dairen continued as depressed as before, while in Fengtien, business was very much hampered by the closure of the Native Exchange by the Chinese authorities towards the end of the first half of the year to prevent the further fall of Fengtien paper currency, and a severe stringency of money was experienced generally in that quarter. In the Harbin district, very important events were continually occurring that affected the political and financial situation, among them being the transfer of the administration of the Chinese Eastern railway to the "Reds," and the complications resulting from the disagreement over freight tariffs between the Manchurian railways on the one hand and the Chinese Eastern and Ussuri Railways on the other. As a consequence, the whole of Manchuria was thrown into a very unsettled condition, and when the Lungkow Bank suspended payment in August, which event was immediately followed by the disclosure of the very unsatisfactory position of the Money Exchange Company, the financial situation went from bad to worse. Reports of an abundant harvest somewhat relieved the acute tension, and signs of improvement were even noticeable, but at this juncture the war between Fengtien and Chihli broke out and conditions deteriorated again so much that the future looked very dark. Towards the end of October, however, General Feng Yu-hsiang suddenly changed his attitude towards his leader, Wu Pei-fu, and brought the war to an unexpectedly early termination, with the result that the financial position improved. In addition, there were fortunately the abundant crops already referred to throughout North and South Manchuria, and as about this time demands from Europe for produce began to come in on a very large scale, from October onward exports consequently showed great activity. During the half-year, exports of beans and bean-cakes recorded the exceptionally good results of 397,000 and 365,000 metric tons respectively, showing relative tonnage increases of 96,000 and 63,000 over the figures for the corresponding period of the previous year. Besides the good exports, large quantities of supplies were sold to the military, thus increasing the purchasing power of the people in the interior, and as a result of the favourable conditions, the sale of cotton piece goods, cotton yarn and sundries improved gradually, so that merchants were not only able to eventually clear off their old stocks, but had to replenish their supplies through importers, who in turn were much relieved by this development. As regards trade with Japan, this country took 40 per cent. and 78 per cent. respectively of the total exports from Manchuria of beans and bean-cakes, while as to imports, although the trade in cotton piece goods and sundries was in a very dull state during the first four months, this unfortunate condition of affairs was more than compensated for towards the latter part of the period when business revived in earnest.

"As regards our own country, what with the slow progress in readjustment on the one hand and the heavy adverse trade balance on the other, the future economic prospect looks very uncertain, and appears to be full of difficulties and obstacles against which we shall always have to make ample provision."

Foreign Loan Obligation of China

The Government Bureau of Economic Information has published a study of "Foreign Loan Obligations of China," a compendium of such secured external loan obligations of China as are provided with regular amortization tables, compiled and edited by J. R. Baylin of the Banque de L'Indo-Chine.

The design of the publishers of this compilation is to furnish those interested in the financial affairs of China in general, and in the buying and selling of China's bonds in particular, with a handy reference to those Foreign Loan Obligations of China which have been secured and provided with regular amortization tables. Hitherto the public has not had access to any such compilation, and those desiring information have been confronted with the necessity of undertaking tedious research to obtain it.

The texts of the loan agreements have not been given, the work being confined to the fiscal conditions of the various loans and the amortization tables accompanying them.

A list of payments falling due in 1925, and for which the necessary funds can be raised, has been attached.

The loans have been grouped under general, railway and telegraph loans, in that order, and easy access can be gained to any particular loan by means of the list of contents.

The matter is so arranged that the facts of each loan stand out clearly, thus making it easy for the non-specialist to get at the facts.

The Sinclair Oil Concession Cancellation

ONE of the prettiest political business deals ever to be tried in the Far East was the Sinclair Oil Concession. The facts may be stated in a few sentences: Japan (on terms of friendship with the United States), was in occupation of Saghalien. Russia (not recognized by the United States), claimed Saghalien. Russia gave a concession for the oil of Saghalien to the Sinclair Oil Company, an American corporation on condition that the United States would recognize Soviet Russia. Mr. Sinclair and Secretary Fall were supposed to have an inside track to the President and government of the United States. With the concession in their pockets, the Sinclair organization was to proceed to Washington to work for recognition. They had a vested interest in recognition. Recognition meant oil and money to them. The Soviet commissaries at the time believed that the Sinclair organization could get the American government to recognize Soviet Russia. They gave them the concession because they believed that. **They gave them the concession because they had been mis-informed about the American people and government, because they misunderstood, because they believed that if an American corporation could get money out of Saghalien, the American government would go to war with Japan to drive the Japanese out of Saghalien.**

They were fooled. The American government did not go to war with Japan to drive Japan out of Saghalien. The American government paid no attention to the Sinclair contract. The American government ignored the Sinclair arguments. To this day, the Amerian government has not recognized Soviet Russia, but Japan has. And therein lies the rub, for not only has Japan recognized Russia, but Russia has given Japan an oil Concession in Saghalien by solemn treaty between the two governments. *In a word, the little Sinclair plot has failed to bring about trouble between Japan and the United States, and by a sort of poetic justice, it has helped Japan.*

That the Sinclair people knew what they were up to and what Soviet Russia wanted is obvious from the remarks of the Soviet lawyers at the Moscow trial to cancel the concession. The lawyers said :

The Counsel for the plaintiff asked the court to declare the contract null and void, and demanded that the Company pay a fine for breach of contract and compensation for the alleged loss resulting from the fact that the Company had not begun to develop the concession within the contracted period of one year, nor within the supplementary period granted by the Soviet government.

The Counsel further declared that the concessionaires at the time of the conclusion of the contract, were aware of the Japanese occupation of Saghalien, and that consequently the company's plea of force majeure was invalid. Moreover, he declared that the Soviet authorities, and particularly the Soviet Ambassador in China, had given every possible assistance to the Company's expedition for the exploration of Saghalien.

He endeavored to prove that the Company, knowing of the presence of the Japanese troops, incurred the risks involved.

For the defence, the Counsel denied these assertions, gnd insisted that the Company took all possible measures to ensure developments but were frustrated by external interference.

They admitted knowledge of the presence of the troops, but declared that they did not realize to what extent the Japanese would resist the entry of the expedition into the territory of the concession.

The Soviet Concessions Committee Chairman, Gregory Pyatkoff further made the point that the Soviet government had been prodding the Sinclair Oil Company to live up to its agreement. An Associated Press Despatch from Moscow dated February 22, reads :

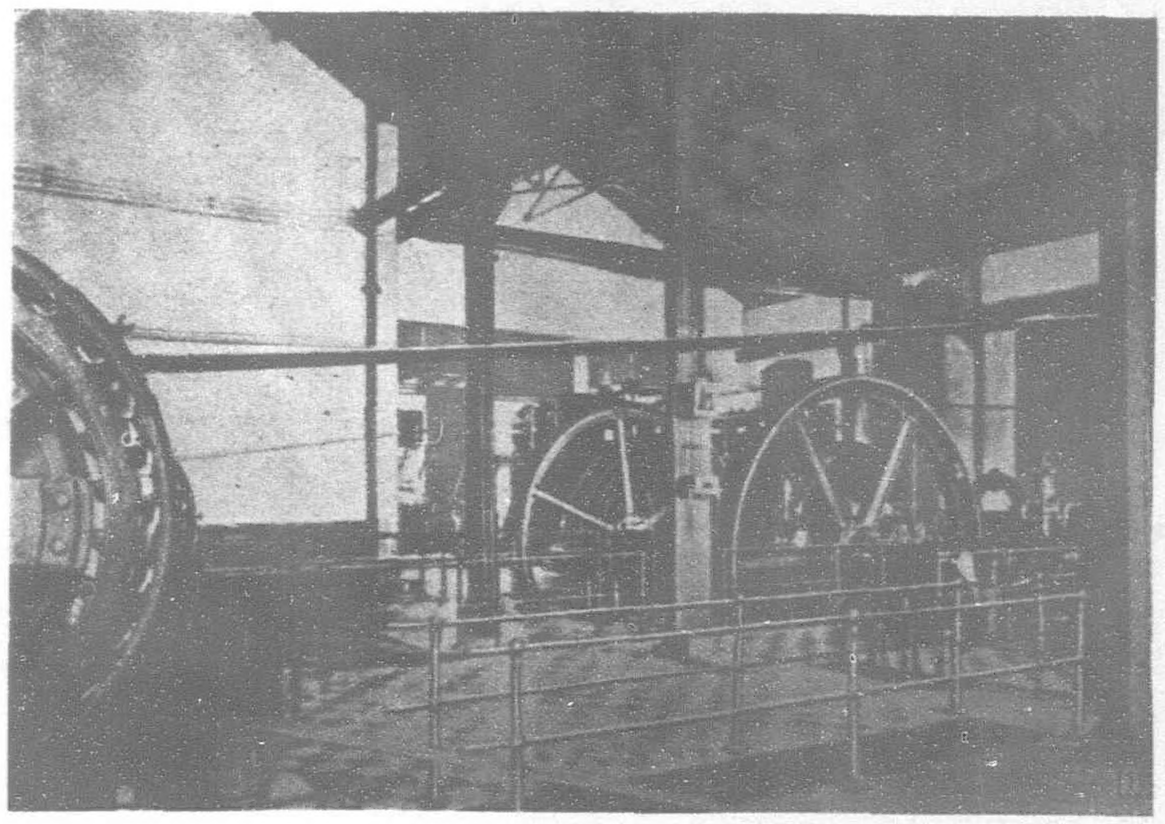
Pyatkoff declares that long before the Russo-Japanese treaty was concluded the Soviet government warned the Sinclair company that non-fulfillment of the agreement would force the government to refer the matter to the courts. He says that in 1924 he gave the company six months in which to comply with the terms of the contract. Evidently referring to the failure of an alleged attempt by the Sinclair company to induce the American government to recognize Russia, Pyatkoff says :

" The Soviet government is convinced that the Sinclair company is unable to carry out certain obligations enumerated in the contract because it over-estimated its own weight and importance in political matters and has not received and support from its own government."

Nothing can be more clear. The concession was granted in return for the Sinclair organization working for recognition of Soviet Russia by the United States. That was the Soviet understanding. That was undoubtedly what Sinclair agents told the Soviet government they could do. Soviet Russia would have given its right eye to be recognized by the United States, and what are oil wells in Saghalien compared with that ? Had the United States become a party to the plot, had the American government recognized Soviet Russia, had it supported the Sinclair Concession, what would Japan have done ? What would have been the relations between the United States and Japan had the United States recognized the Sinclair Consession ? Would the United States have gone to war to drive the Japanese troops out of Saghalien ? Would the United States have gone to war with Japan to support concessionaires against every sane interest in the country. That is what might have happened if this deal had gone through as planned. That is what Americans operating carelessly in the Far East might have brought upon their country. Fortunately, wise State Department saved the world from such a calamity.

Sulzer Diesel Engines in the Pnom-Penh Municipal Electric Works, Indo-China

Sulzer Bros. have installed two 270-b.h.p. Diesel engines in the Municipal Electric Station at Pnom-Penh for supplying light and power to the town. The station is located in the middle of a marsh on a peninsula at the confluence of the rivers Me-kong and Toule-sap, about half a mile from Pnom-Penh. About two-thirds of the energy generated by the Diesel sets is used for street

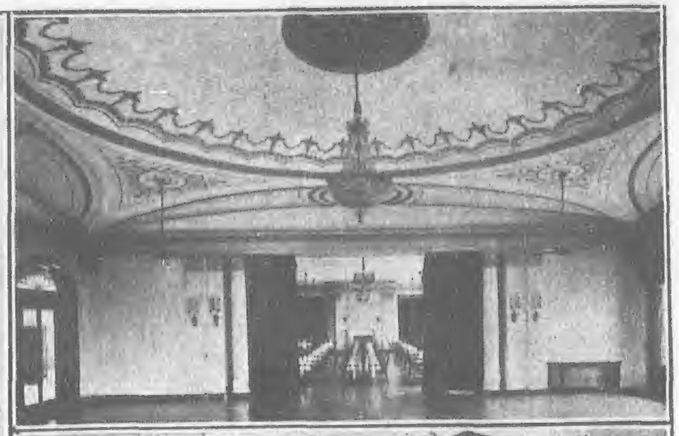


Municipal Electric Works, Pnom-Penh, Indo-China, Equipped with Two 270-b.h.p. SulzerDiesel Engines

lighting and the remainder for working the pumps at the municipal waterworks and for driving various small motors and fans. In addition to the Diesel engines there are also four small steam engine sets which are put into service when required. The Diesel engines run about 600 hours monthly, and the steam engines about 200 hours, the total amount of electric current generated daily amounting to about 8,500 units. The Sulzer Diesel engines are of the four-cylinder four-cycle type, running at 187 revs. per min. and coupled to 225-k.v.a. 4,200-volt flywheel type generators supplied by Brown Boveri & Co., Baden, Switzerland.

The Mah Jong Room

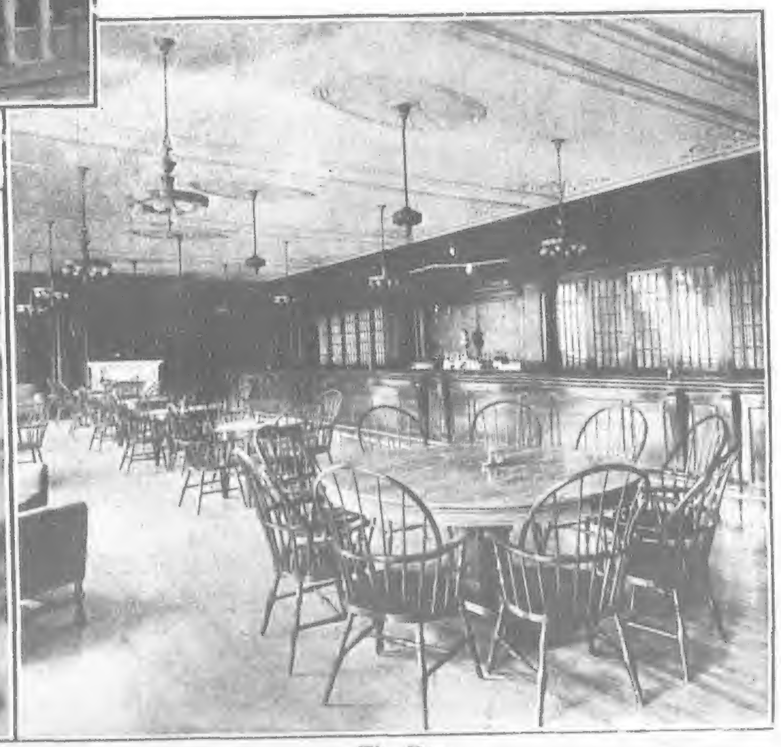
The American Club, Shanghai



Library

The Card Room

The American Eagle in the Lobby

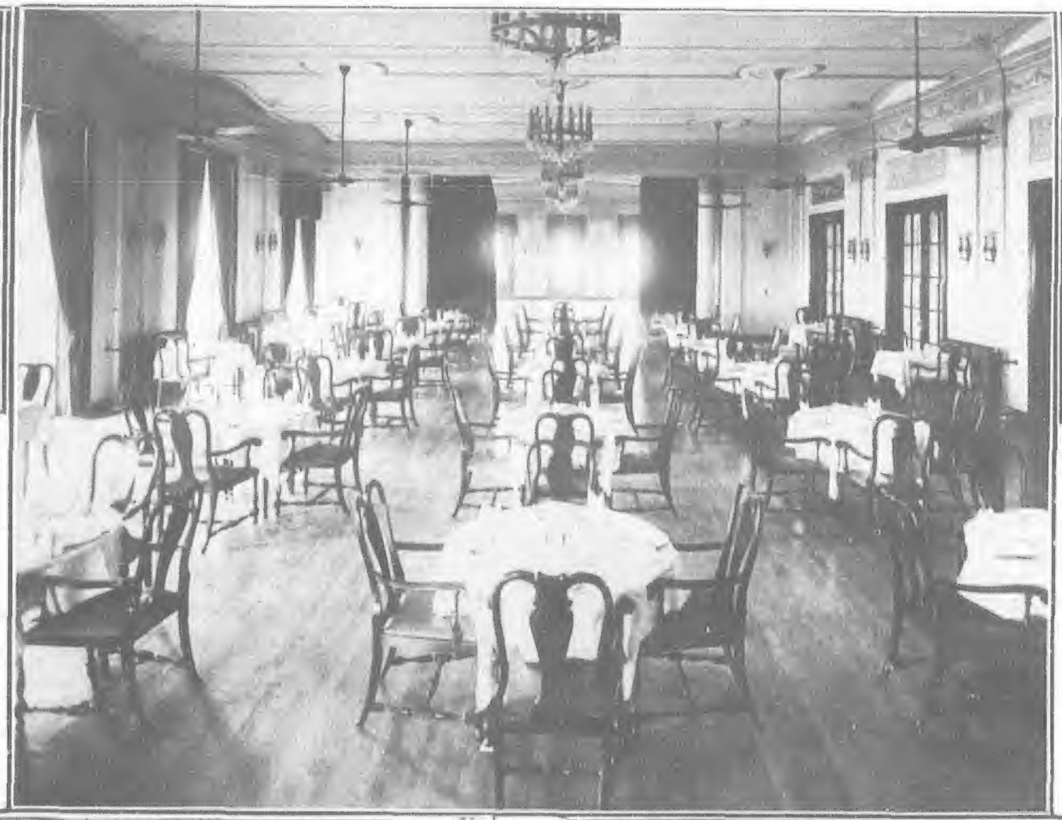


The Bar

Library *(top)*

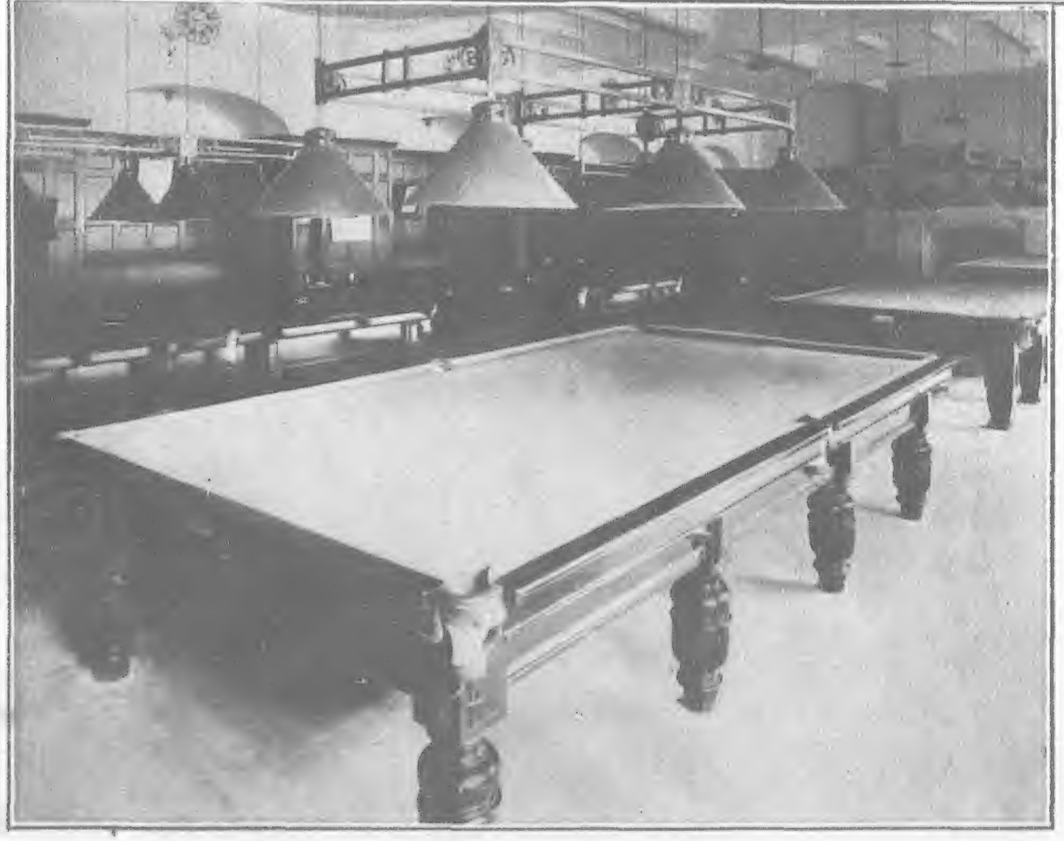
Dining Room *(centre)*

Billiard Room *(bottom)*



A Corner of the Lobby *(top)*

Bedroom *(bottom)*



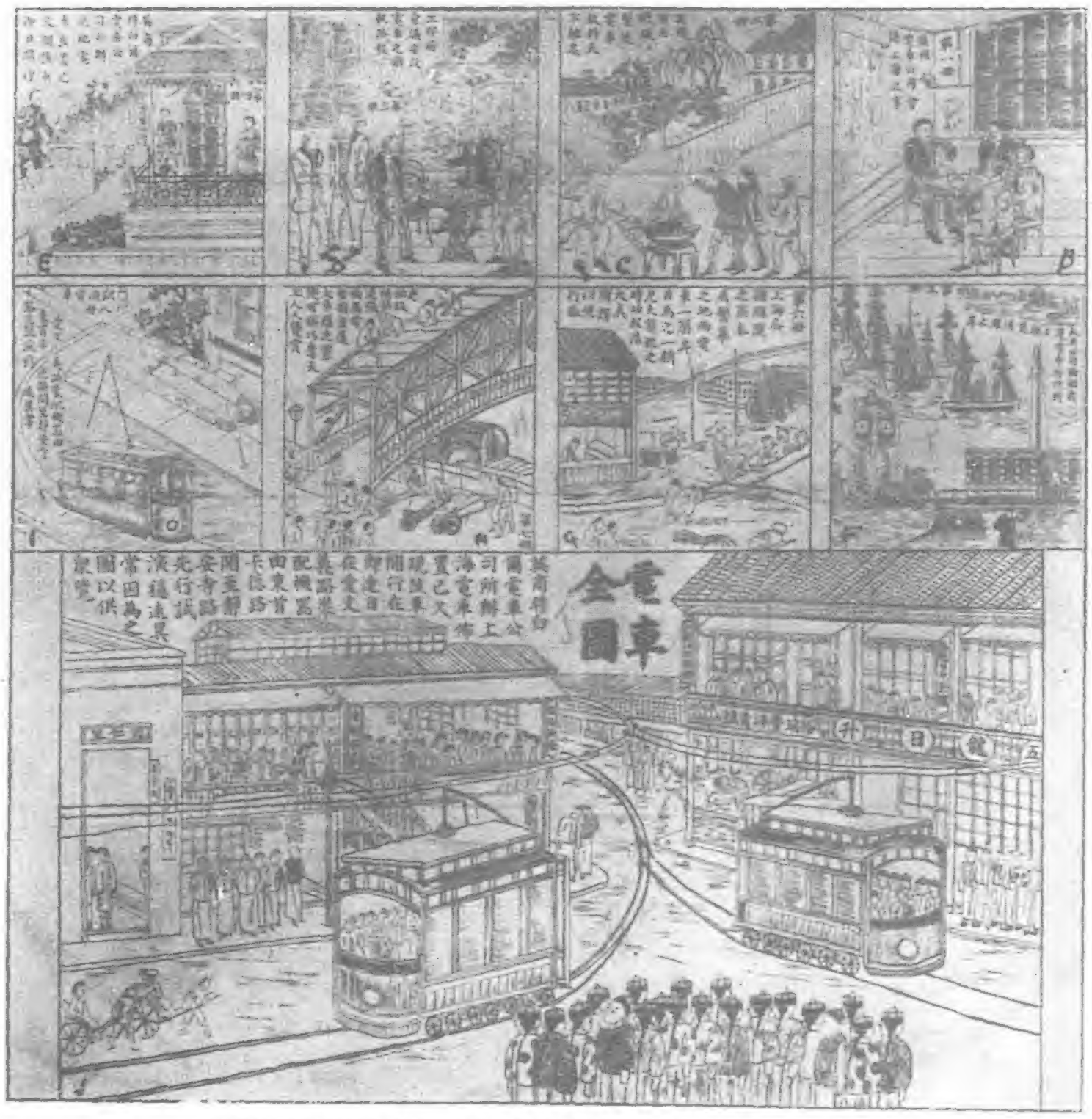
The Peking Electric Tramway System

By Lawrence Impey

AFTER overcoming many difficulties and encountering much opposition on the part of both the press and various official organizations, the electric tramways of Peking have been constructed and the working of them commenced. For those who know something of the mediaeval condition which exist in many parts of China and who comprehend in some measure the innate aversion of the Chinese to any startling innovation, this tramway scheme, apparently insignificant, assumes an evolutionary characteristic of the greatest importance.

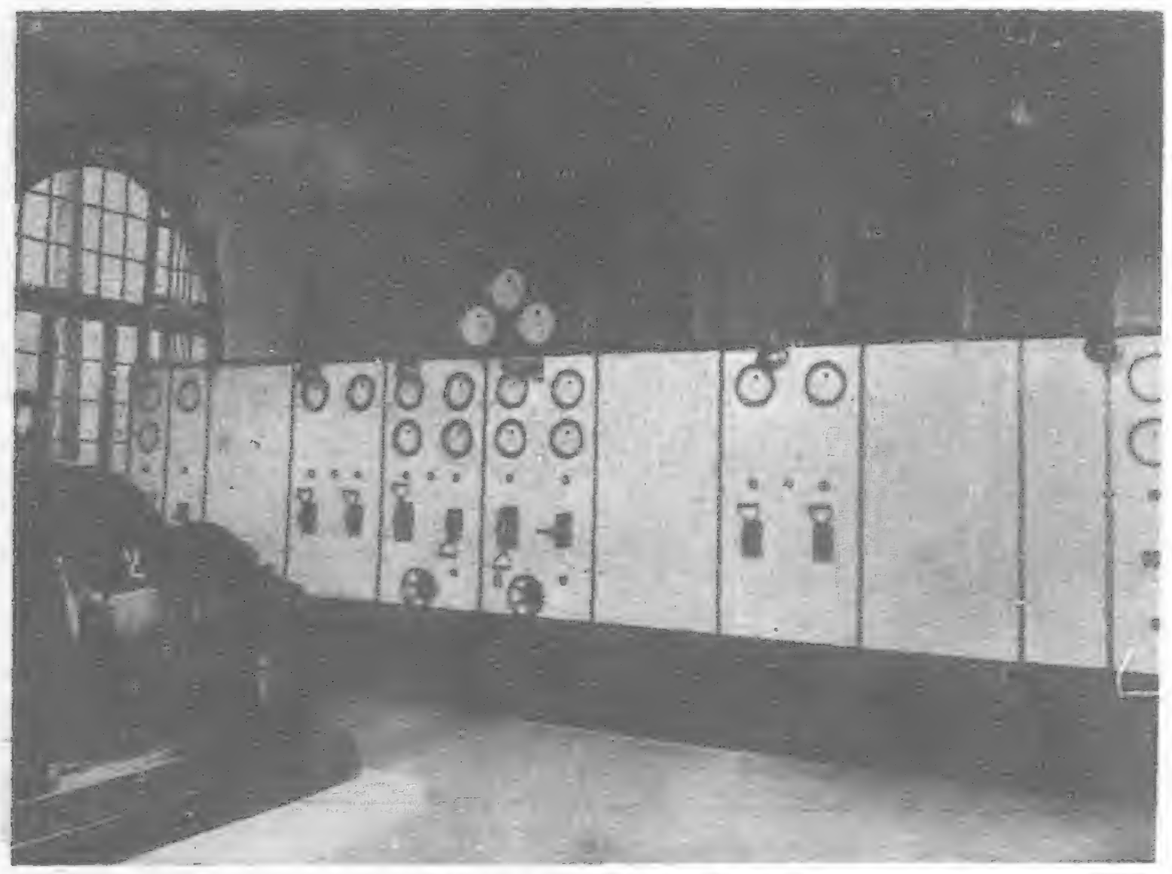
Up to date the only places which possessed an electric tramway system were the British colony of Hongkong and the Chinese cities of Tientsin and Shanghai, and these latter had foreign concessions which greatly facilitated the work, so that Peking has the distinction of being the first purely Chinese city to attempt an installation, an example which will probably be speedily imitated elsewhere should it prove successful. In considering the working of the Peking system the writer does not intend to dwell at length on the financial and administrative organization of the company, which was described by him in some detail in the FAR EASTERN REVIEW for June, 1924, but at the same time it may not be out of place to pay a tribute here to the work of Mr. Tang, that energetic administrator and able diplomat, and the skill of Mr. Laforest, the chief engineer for the company and formerly director of the French tramways in Shanghai, in bringing the scheme to a successful culmination.

During the months prior to the inauguration ceremony and even when the trams had actually commenced to work, it was noticeable that there was a considerable campaign in the press against them on the grounds that they would compete with the rickshaw traffic and thereby throw many coolies out of work. Whether this will prove to be the

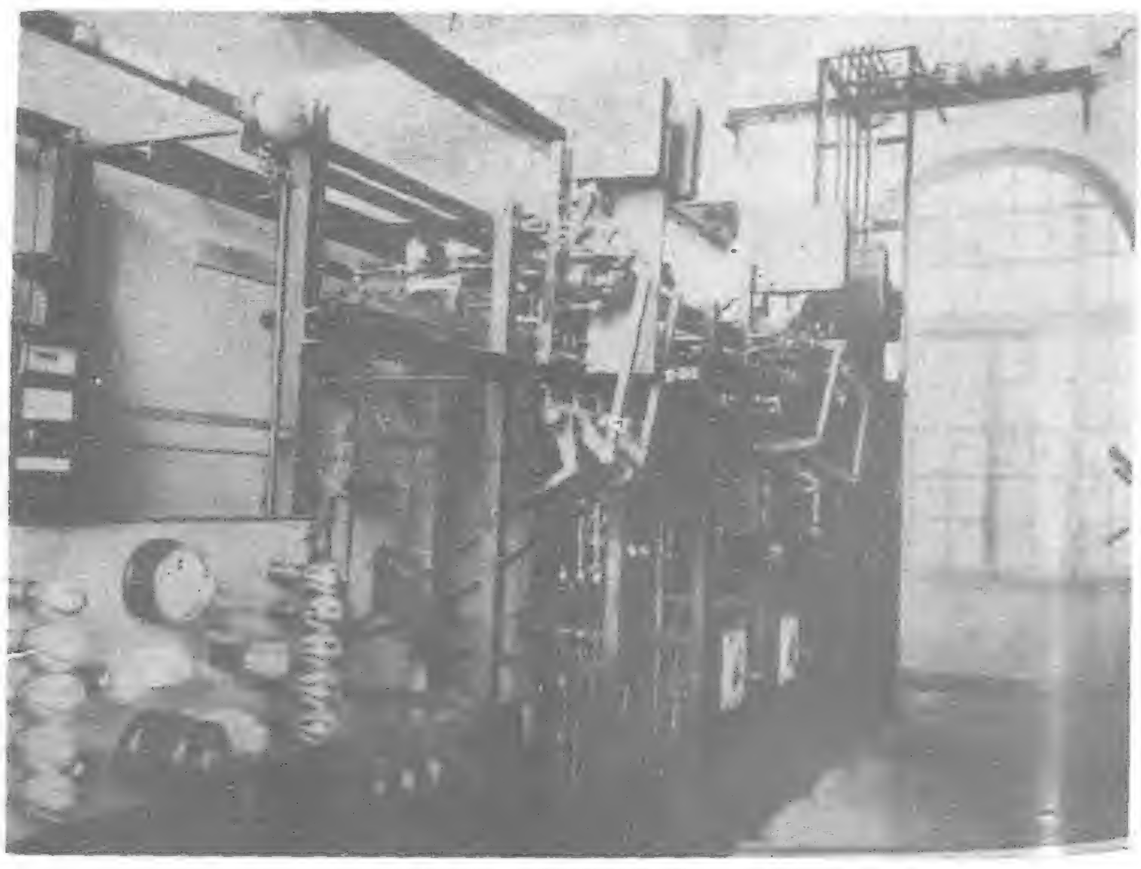


REPRODUCTION OF CHINESE NEWSPAPER 1908

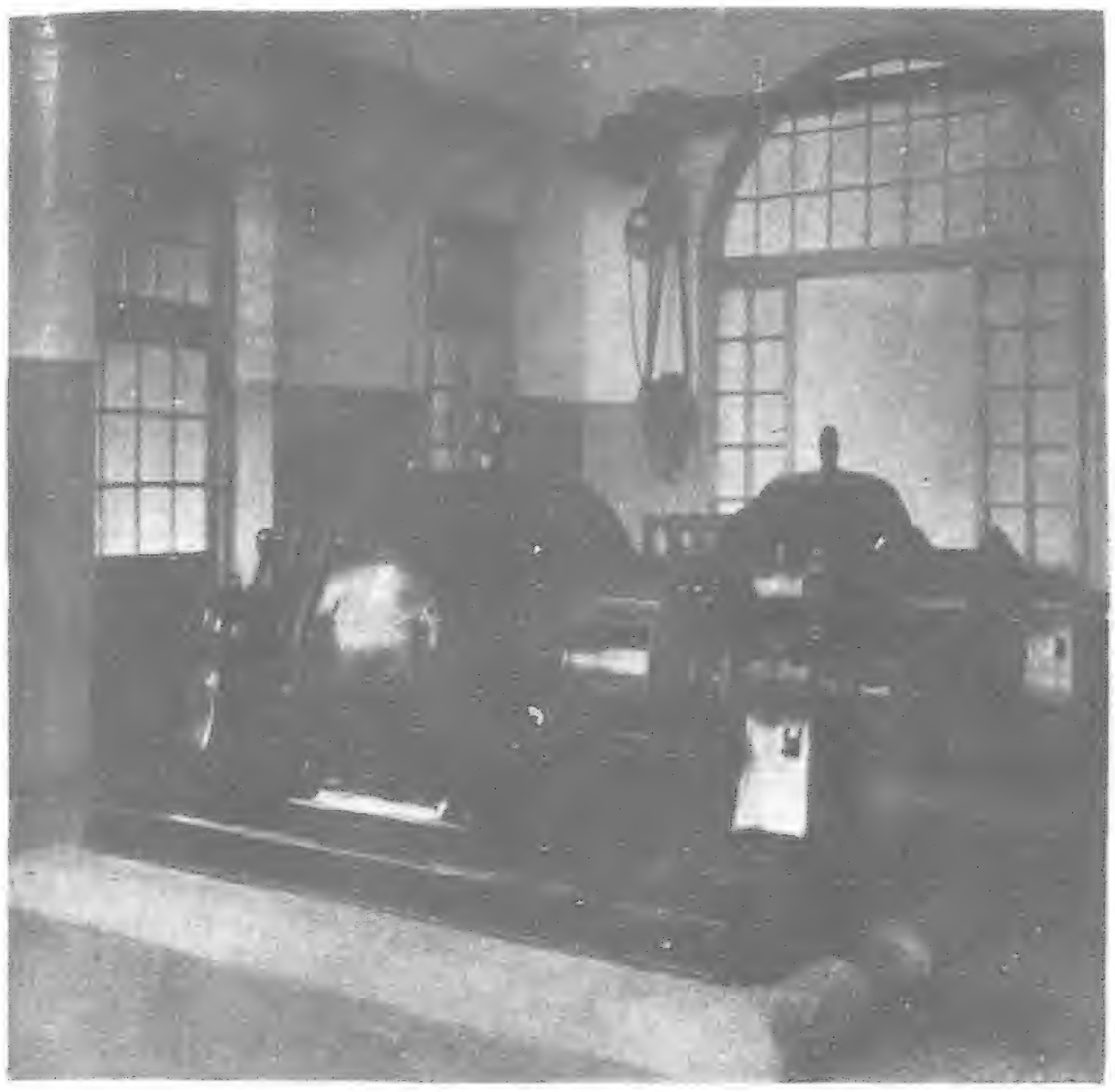
(*b*) Meeting of the Board of Directors of the Shanghai Tramway Co. held in England.
(*c*) The British foundries constructing the rails, these foundries are the most famous in the world.
(*d*) A Meeting of the Shanghai Municipal Council decides on the installation of the tramways.
(*e*) The office of the contractors, Messrs Peebles & Co.
(*f*) The materials for the tramways arrive at Shanghai and pass the Customs.
(*g*) The famous port of Shanghai undertaking the laying of the tramways.
(*h*) The iron bridge at North Chekiang Road is such a work of art that the trams can cross it, everyone should see this wonder.
(*i*) The tramway service from Avenue Road into Carter Road is placid in the extreme.
(*j*) General view of the tramway system. This picture is drawn in order to accustom our readers to the sight of this novelty, which will shortly be in operation.



Sub-Station Switch Boards



Sub-Station Switch Boards



Rotary Convertors

case in Peking only time can show, but deductions which can be made from the following statistics gathered in Tientsin and Shanghai appear to show that this dimunition in the number of rickshaws need not necessarily take place.

SHANGHAI MUNICIPAL COUNCIL

Average number of licences issued to vehicles annually.

Years	Rickshaws	Carriages	Motors	Wheel-barrows	Chairs	Carts
1907 ..	13,829	1,635	96	7,386	661	1,090
*1908 ..	12,892	1,511	119	7,060	619	1,046
1909 ..	12,740	1,414	133	6,020	501	993
1910 ..	12,498	1,366	151	5,804	331	982
1911 ..	11,111	1,277	217	6,310	199	958
1912 ..	13,252	1,269	268	5,790	94	1,003
1913 ..	13,777	1,278	342	6,437	46	1,230
1914 ..	13,867	1,190	443	6,938	35	1,400
1915 ..	13,816	1,053	539	6,777	28	1,425
1916 ..	12,855	1,015	673	7,460	25	1,546
1917 ..	13,691	941	819	8,404	27	1,718
1918 ..	14,209	886	1,061	8,117	17	1,821
1919 ..	14,726	831	1,378	8,667	16	2,141

N.B.—The tramways were introduced in 1908, and the following is an extract from the Shanghai Municipal Council Report for that year, the subject being Public Rickshaws : " It was anticipated that with the advent of tramcars these vehicles would show a considerable reduction in number, but this has not been the case. There was, however, a slight falling off during the summer months, but for the last three months the number has recovered and in now fully up to the average for the preceding year (in 1906—12,594 rickshaws)."

TIENTSIN FRENCH CONCESSION.

Annual licence fee receipts in taels.

Years	Rickshaws	Carriages and Motors	Wheel-barrows	Carts	
1905 ..	20,290	230	5,431	9,524	
1906 ..	20,522	323	5,920	10,977	—Tramways started
1907 ..	20,753	349	5,894	8,979	
1908 ..	21,122	284	5,129	5,607	
1909 ..	21,682	261	5,196	4,876	
1910 ..	21,651	242	5,804	4,760	
1911 ..	16,345	333	6,152	4,463	—*Prohibition of houses of prostitution.*
1912 ..	18,718	607	7,118	4,981	
1913 ..	17,471	1,420	8,314	5,961	
1914 ..	16,753	1,431	11,364	8,334	
1915 ..	14,801	1,503	11,494	8,215	

Years	Rickshaws	Carriages and Motors	Wheel-barrows	Carts
1916 ..	15,437	1,984	12,128	8,857
1917 ..	17,004	2,670	12,808	9,466
1918 ..	19,130	3,505	13,587	9,771
1919 ..	20,383	4,337	14,587	10,374
1920 ..	25,464	7,179	15,222	11,327
1921 ..	30,281	9,058	15,714	12,423
1922 ..	32,079	10,337	18,338	14,393

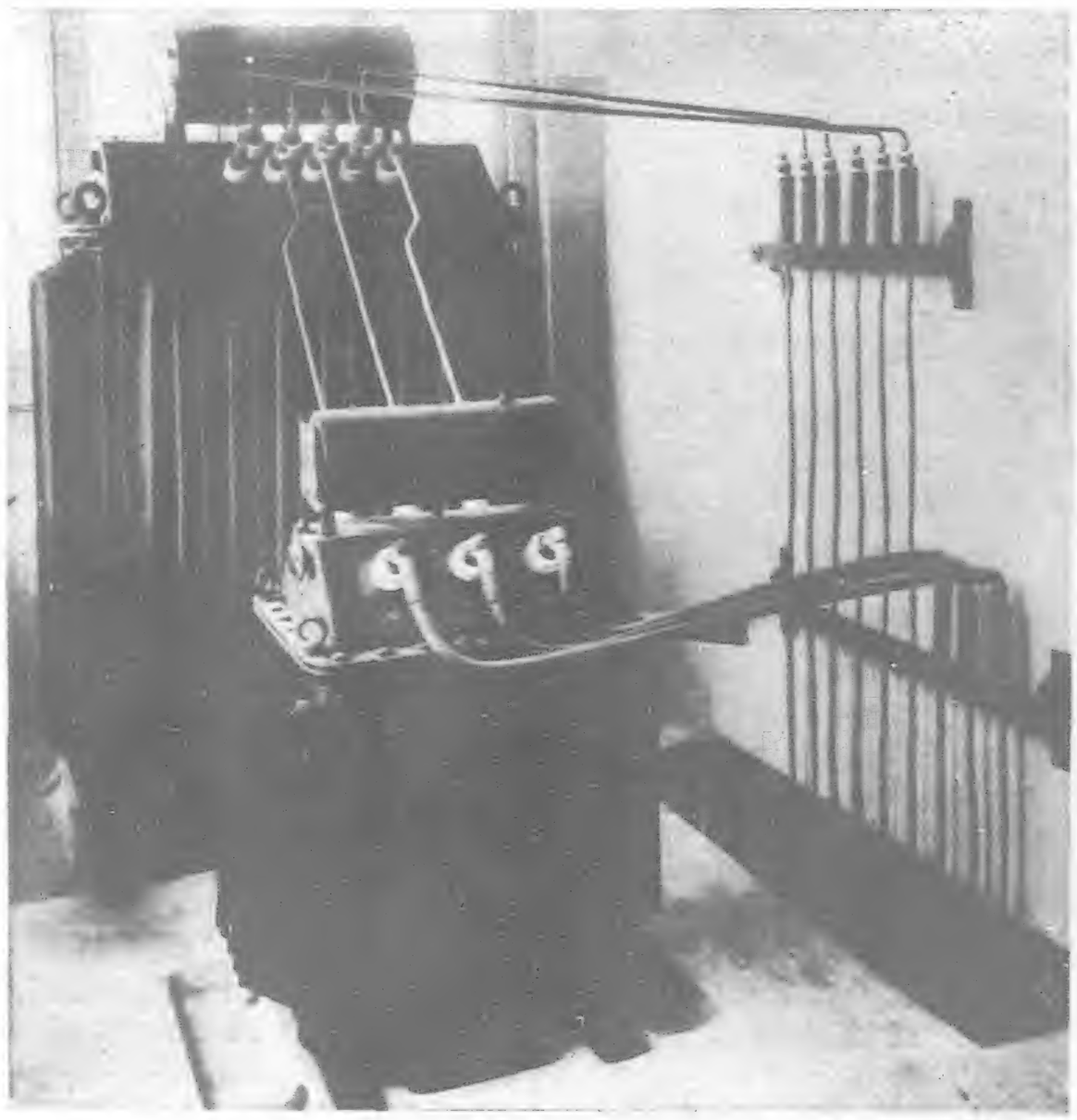
How can one best explain this increase in vehicular traffic in the face of keen competition on the part of the trams ?

In the opinion of the writer the most important argument which can be advanced, is the statement that increased facilities for travel of any kind encourages all classes of the people to take journeys, hence the larger aggregate of passengers for the rickshaws in spite of the tram traffic. The same argument may be used in regard to the use of carts, for while it is obvious that the railway system must take over the bulk of the passenger and freight trade for any distance over a few miles, it appears that the transportation of these same passengers and goods to and from the stations has actually led to an increase in the number of carts in use in many provincial towns in China.

One of the principal objections presented in the vernacular press and elsewhere as to the use of electric trams in Peking is based on the idea that these vehicles cannot but increase the congestion in the traffic on the main roads. Here the writer's experience as an engineer leads him to admit that there may be some grounds for the suggestion, for the same point has been frequently discussed abroad when the relative merits of trams and motor vehicles were being considered, one party arguing that with the trams that were restricted to a certain definite area it was easier to control the remainder of the traffic, while the opposition pointed out that the motors had freedom of movement and could therefore go round obstacles and avoid any crowding of the streets.

But the consideration in Peking is not so much the relative merits of trams and motors as an agent on traffic, as a question as to whether the tramways or the other vehicular traffic cause the greater congestion. In this regard one may consider the following figures as an approximate comparison of road space occupied by rickshaws and trams respectively :

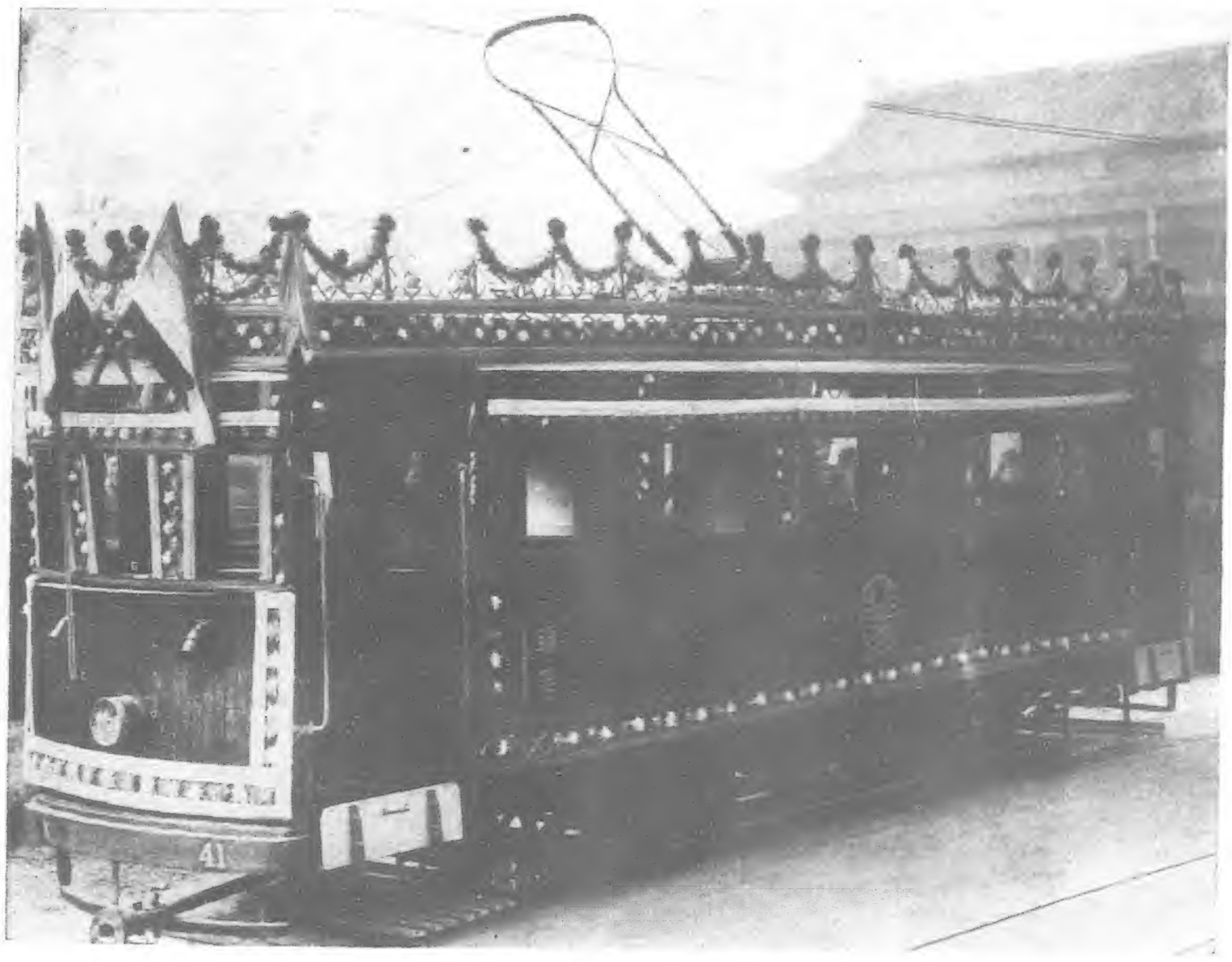
	Trams.	Rickshaws.
(*a*) Number of passengers carried per vehicle	50	1
(*b*) Miles per hour (including stops) ..	8.8	6



Sub-Station Transformer and Reactance

(*c*) Travelling m.p.h. (C=A×B) ..	440	6
(*d*) Area occupied by each vehicle in square feet	200 s.f.	25 s.f.
(*e*) Practical traffic area occupied by each in s.f.	200	71½
N.B.—35 rickshaws massed wheel to wheel were found to occupy 2,500 square feet.		
(*f*) Road space occupied by 50 travellers therefore	200 s.f.	5,220 s.f.

From these statistics one may deduce therefore that (*a*) A tramcar will effect the same transportation as 73 rickshaws, and (*b*) A tramcar is occupying only 1/26th of the road surface required by the 73 rickshaws. It is evident that one of the most important factors bearing upon the establishment of an electric tramway system is the width and nature of the roads which are available. In this respect Peking is at present at a considerable disadvantage as compared to cities in Europe or America, for while the total width between building frontages on the main streets in Peking is probably 150 feet or more, the actual road width varies from 40 to 50 feet only, the remaining space being wasted to a very large extent, owing to the annoying habit which the Chinese people possess of walking in the road in preference to using the sidewalk.



The Inaugural Car

In estimating the road area necessary for a tramway system it may be said that a width of 30 feet is the absolute minimun required, and even then only a single track can be laid, by which the speed, frequency of service and carrying capacity of the system is greatly impaired. In this respect Shanghai is at a disadvantage when compared to Peking, for an inspection of the road widths in the International Settlement of the former shows that :

60 miles of roads have a width of less than 30 feet between paths.
12.3 ,, ,, ,, of 30 feet average.
7 ,, ,, ,, of 40 ,, ,,
2 ,, ,, ,, of 50 ,, ,,

It is chiefly for this reason that the Electrobus system was installed in the French Concession and International Settlement at Shanghai in order to augment the service given by the ordinary tramway system, which was not able to negotiate the most narrow streets. But this is only an isolated instance and one which, as has been said, does not apply to Peking and such other cities as have main roads with a width of more than 40 feet.

One may notice in this connection that a national Commission reporting in 1920 on the problems of the Electric Tramways of the United States expressed the view that "street tramways are the most nearly adequate reliable and satisfactory system available for transporting the maximum number of people through the streets of our cities. Where roads are straight and wide as in most cities of the United States, tramways have every advantage as an efficient means of transport."

The Installation of the Peking Tramways

Routes.—The accompanying map will give the reader some idea of the tramway system as it now exists and how it serves the needs of the different parts of the Tartar and Chinese cities of Peking.

Length of route laid with double track, 10.35 miles; length of route laid with single track (partly in use), 5.25 miles; car tracks at depot and sheds, 1.82 miles; length of single track to be completed, 2.62 miles; total length of track laid (one metre gauge) 30.39 miles.

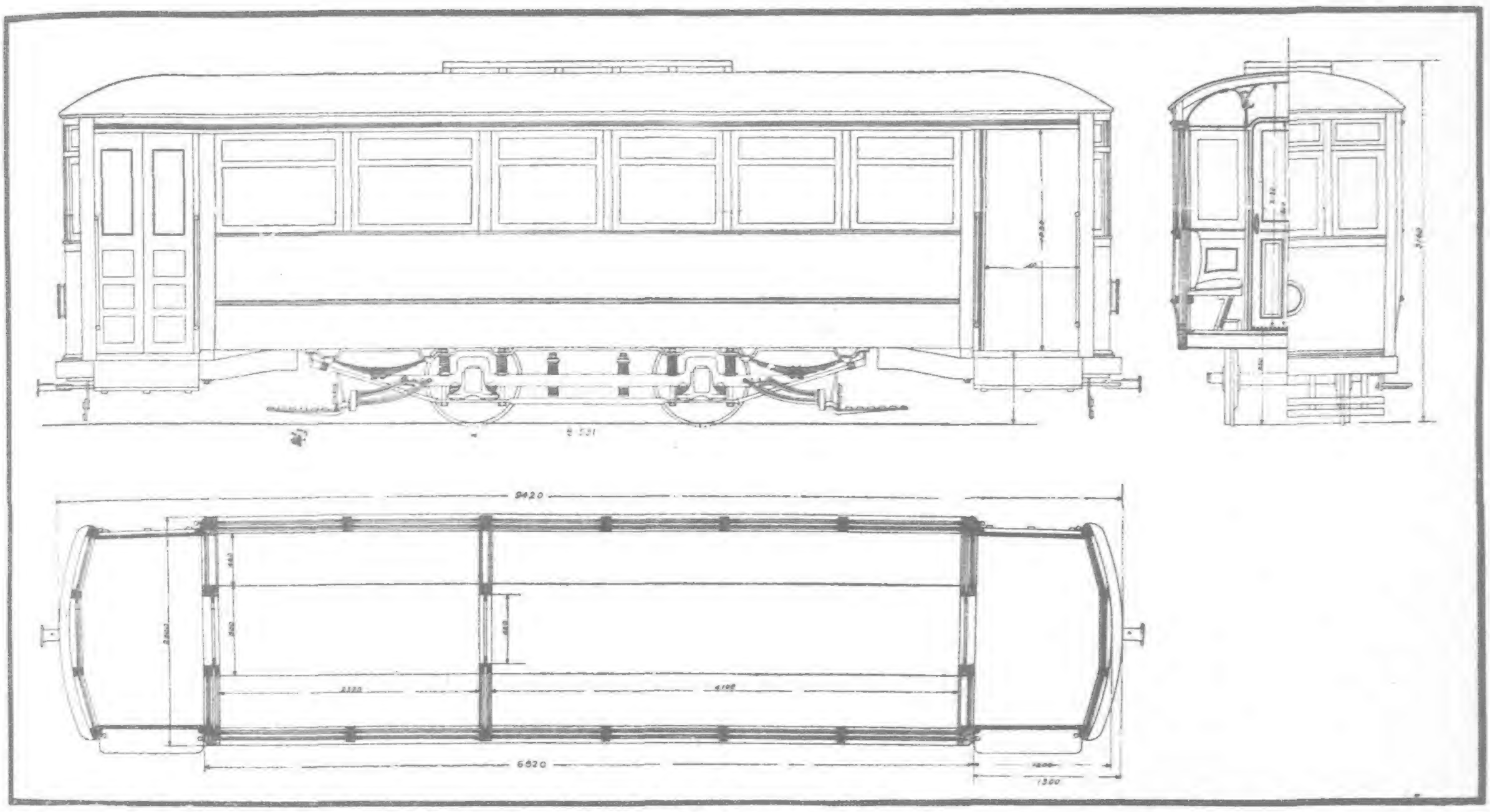
Rails.—The rails are supplied by the French foundries of Longwy, and are of the U V F III type weighing 47.77 kilos per metre (96.25-lbs. per yard). These are laid on a foundation of hard broken stone placed in parallel trenches and embedded in the ordinary road material. The minimum radius of curve on the route is 25 metres. For the depot and shed tracks Tignole rails of 20 kilos per metre (40.2-lbs. per yard) have been employed, these also coming from French workshops.

Overhead Equipment.—The standards are of reinforced concrete and were manufactured in Peking by the firm of Brossard Mopin, being placed either between the tracks or to the side of them as best suits the locality. The live wire, which is carried either by brackets or suspension cables has a section of 63 millimetres (about No 00 S.W.G.) The other overhead equipment comprises the lines for the alternating and high tension current, the supply lines for the continuous current, and the signal cables, etc. The repairs to all the overhead street wiring are carried out by means of the usual repair tower mounted on a Delahaye truck for portability.

Rolling Stock.—This comprises 96 cars, of which 66 are equipped with motors and 30 are trailers. Of the 66 first named 4 are used for the transportation of material and 2 as watering cars. The chassis of all there vehicles comes from French factories, being of the standard Brill 21 E type, while the superstructure was manufactured in China under contract. The width of the cars varies from 8-ft. 6-in. for the motor equipped to 7-ft. 6-in. for the trailers.

The electrical equipment for the cars is supplied by the Societe des Constructions Electriques de France and is of the standard Dick Kerr type. The current is tapped from the overhead wire by means of a bow pattern feeder and not by a trolley wheel, which is not now considered so efficacious as the bow pattern.

Each car is fitted with two motors of 30 h.p. capable of developing 55 h.p. for a brief period if required, thus giving a total of 110 h.p. in emergencies. The traction pull is approximately 3 tons at the tyres of the wheels. The total weight of a car, that is chassis and body, is 9.6 tons, while that of the trailer is 5.8 tons.



Plan of Tram Car Used in Peking System

The cars have 1st and 2nd class compartments which are entered from the extremities, while the trailers have only the 2nd class and are fitted with central doors of admittance of passengers. As a matter of observation the writer would say that differentiation of class was of no great utility in Peking at the present time, for the bulk of the soldiers and police students appear to ride without paying their fare, thus leading to disputes with the tramway employees on several occasions and greatly inconveniencing the general public which desires to travel in peace and comfort. In this question the tramway company deserve some sympathy, for without the fullest support from the authorities, which they are scarcely likely to obtain, it is difficult to see what they can do to remedy matters short of closing down the system for a time until the weight of public opinion compels the government of Peking to support them.

The car bodies are built very much on the lines of a railway carriage on the Chinese railways, being of varnished wood, it being expected that this will prove more satisfactory than metal frames, which are both hot in summer and cold in winter. At the same time there is an installation of electric radiators in the cars which enables them to be heated during the winter months, when the bitterest cold is to be experienced.

Depot and Repair Shops.—These buildings are situated in the southern part of the Chinese city not far from the Temple of Heaven, are fully equipped for all necessary repair work, and are constructed in reinforced concrete.

The car sheds cover an area of 4,556 square yards and contain 12 lines of rails fitted with repair pits, so that more than one hundred cars can be accommodated thereon at the time. The workshops lie to the north of the Sheds, which have doors opening at both their extremities, and a turntable is fitted between them so as to allow of any necessary handling.

The workshops cover an area of 3,000 square yards, and comprise the following departments :

Carpenter's Shop and Joinery.—Area of 720 square yards and fitted with :

1 Circular saw
1 Band saw
1 Grinder
1 planing and jointing machine.

Turning, Fitting and Winding Shop.—Area of 1,615 square yards and equipped with :

1 Wheel Lathe
1 Lathe, bench length 7-ft. 0-in. and working radius 8½-in.
1 Lathe, bench length 11-ft. 0-in. and working radius 8½-in.
1 „ „ „ 11-ft. 0-in. „ „ „ 10-in.
1 Milling Machine
1 Punch and Shear
1 36-in. pillar sensitive drilling machine
1 26-in. „ „ „ „
1 Grinder
1 Emery Wheel
1 Shaper
1 Planer
3 Winding Benches
1 Impregnating Boiler and Machine complete.

Painting Shop.—Area of 420 square yards.
Blacksmith's Shop.—Area of 120 square yards.
Office and Storeroom.—Area of 120 square yards.

All these above buildings are fitted with steam heating, and the water supply for them is derived from two artesian wells equipped with the necessary pumps and water towers. The lighting system for the shops is supplied, alternating current, by a transformer of 100 k.v.a. The site also contains various buildings for the personnel, together with store sheds, etc., which have not been considered in the foregoing, but which cover a considerable area.

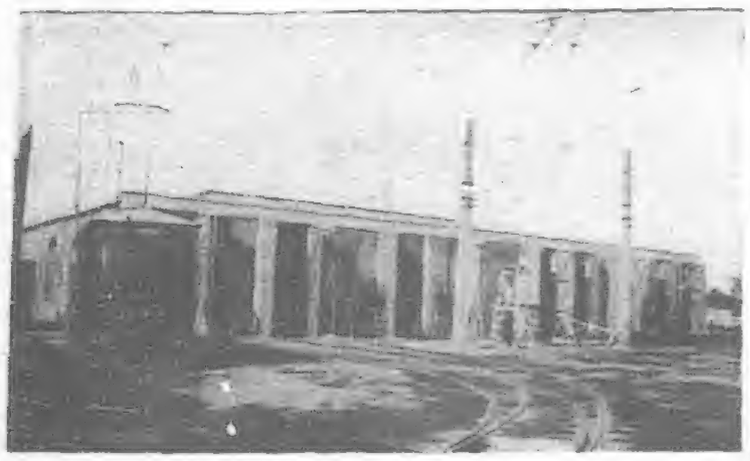
Sub-Stations and Transformers.—The continuous current of 600 volts for the system is supplied by two convertor stations which transform the triphase alternating current 5,000 volts 50 period into continuous current. The material for these two sub-stations was supplied by the Societe Siemens China.

The North Sub-Station contains :

2 Triphase static transformers of 240 k.v.a. (5,000/470 volts)
2 Threephase static reactances of 45 k.v.a.
2 Rotary convertors (hexaphase compound) of 225 k.v.a. (615 v./370 amperes)
1 High tension switchboard with cells.
1 Switchboard for continuous current.

The South Sub-Station contains :

2 Threephase transformers of 400 k.v.a. (5,000/470 volts)
2 Reactances of 65 k.v.a.
2 Convertors (hexaphase compound) 375 k.v.a. (615 v. 600 amp.)
1 High tension switchboard with cells.
1 Switchboard for continuous current.



Car Shed

Tungchow Power Station

Exterior of Car Shed

The Central Power Station.—It is most unfortunate that there is not in Peking or its immediate vicinity any water supply of a volume and character suitable to the needs of an electrical power station of any capacity. To the west of the capital, at a distance of some twelve miles, there is the Yung Ting river, but its current is extremely raid and very muddy in the flood season and almost non-existant during the drought, so that it was impossible to consider it as a source of supply. To the east of Peking at about the same distance runs the Pei Ho, a river whose current is more equable, and it was therefore decided that a power station should be erected on its banks close to the Chinese town of Tungchow, a place of some 30,000 inhabitants. The coal supply is brought on the Peking-Mukden branch railway as far as Tungchow itself, and thence a branch canal of a mile and a quarter supplied by the Pei Ho serves for transportation to the power plant.

The buildings of the latter include :

A boiler room, dimension 67-ft. 0-in. wide 130-ft. 0-in. long and 48-ft. 0-in. high.

Turbine and switchboard room 40-ft. 0-in. wide 150-ft. 0-in. long and 48-ft. 0-in. high.

Chimney stack 175-ft. 0-in. high and 6-ft. 6-in. diameter at the top.

To these must be added the pumping station, the transformer room, the filter plant, engineer's house, offices, storesheds and workshops, etc., the construction of the majority of these being almost completed at the time of writing.

The boiler house contains three Babcock and Wilcox boilers of 4,400 sq. ft. heating surface, each fitted with superheater of 1,210 sq. ft. heating surface, and having a grate surface of 100 sq. ft. per boiler. Babcock automatic fuelers are fitted, and each boiler has a green economiser of 1,720 sq. ft. heating surface. The superheated steam is supplied at a pressure of 14 atmospheres.

In addition to this, foundations are already in place for three more boilers of similar nature, which will thus complete the installation of six as originally planned.

Firing can be either ordinary or draft, by means of a ventilator of 62-in. diameter.

Besides the two feed pumps for the engine room the plant is also fitted with a distilling plant for drinking water.

The Engine Room contains :

1 set if turbo-alternators brown boveri of 120 k.v.a. for auxiliary services.
2 sets of turbo-alternators brown boveri of 900 k.v.a. for the tramway system.
1 set of turbo-alternators brown boveri of 1,800 k.v.a. for the tramway system.

In addition to this the foundations are in place for a further set of 3,600 k.v.a. while the recent installation of a 30 ton bridge crane has greatly improved the facilities for handling the machinery.

The current produced is an alternating threephase of 5,000 volts 50 periods, and the switchboard system, which covers three stages, has been calculated to permit of considerable future extensions.

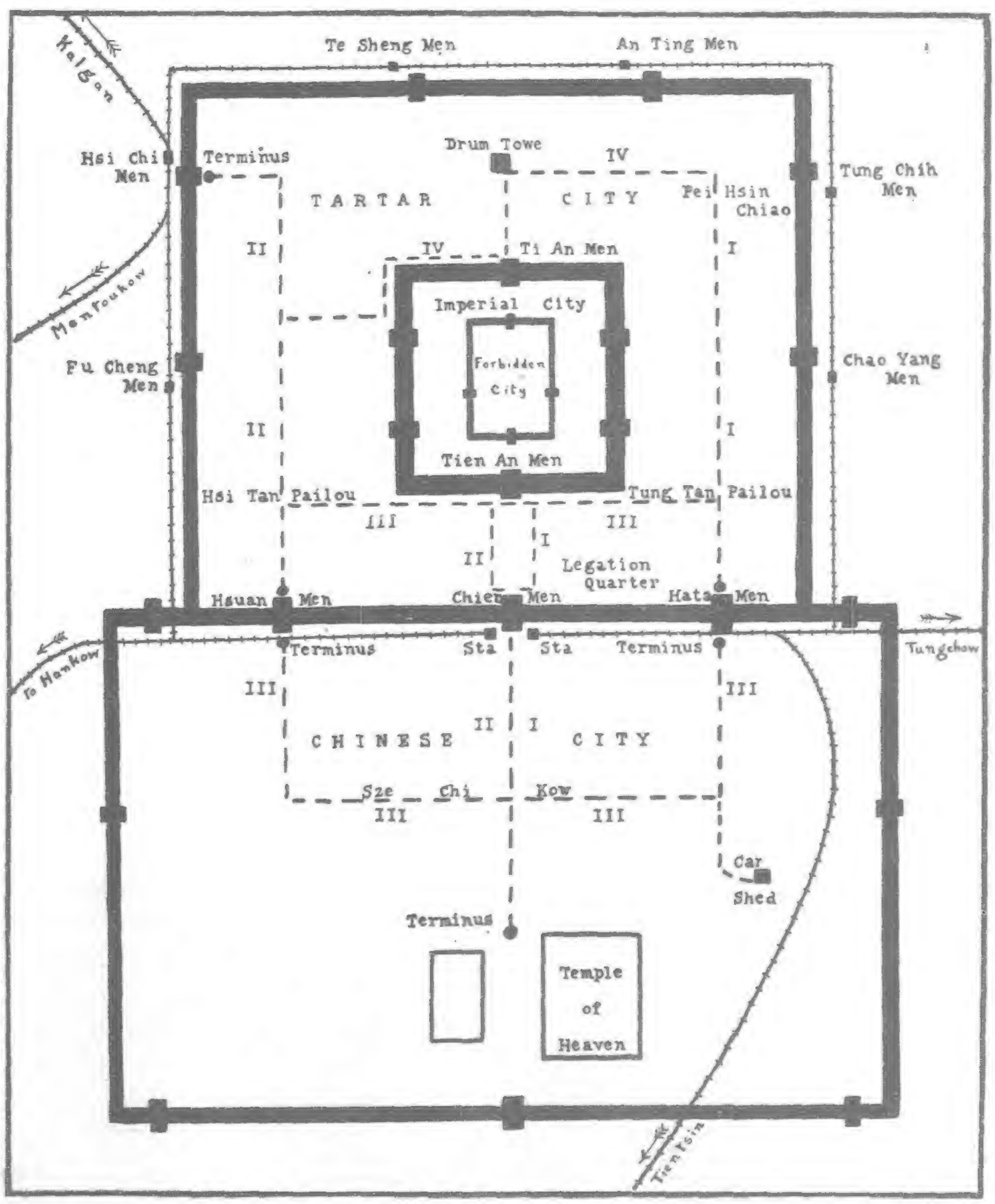
The adjoining transformer room contains two threephase transformers of 2,725 k.v.a. which enable the current to be stepped up from 5,000 volts to 33,000 volts for transmission to Peking.

The pumping station contains three sets of motors, one delivering 100,000 gallons per hour and the other two 200,000 per hour, while additional space has been provided for the installation of further plant to deliver 400,000 gallons per hour. These are all supplied by the firm of Sulzer.

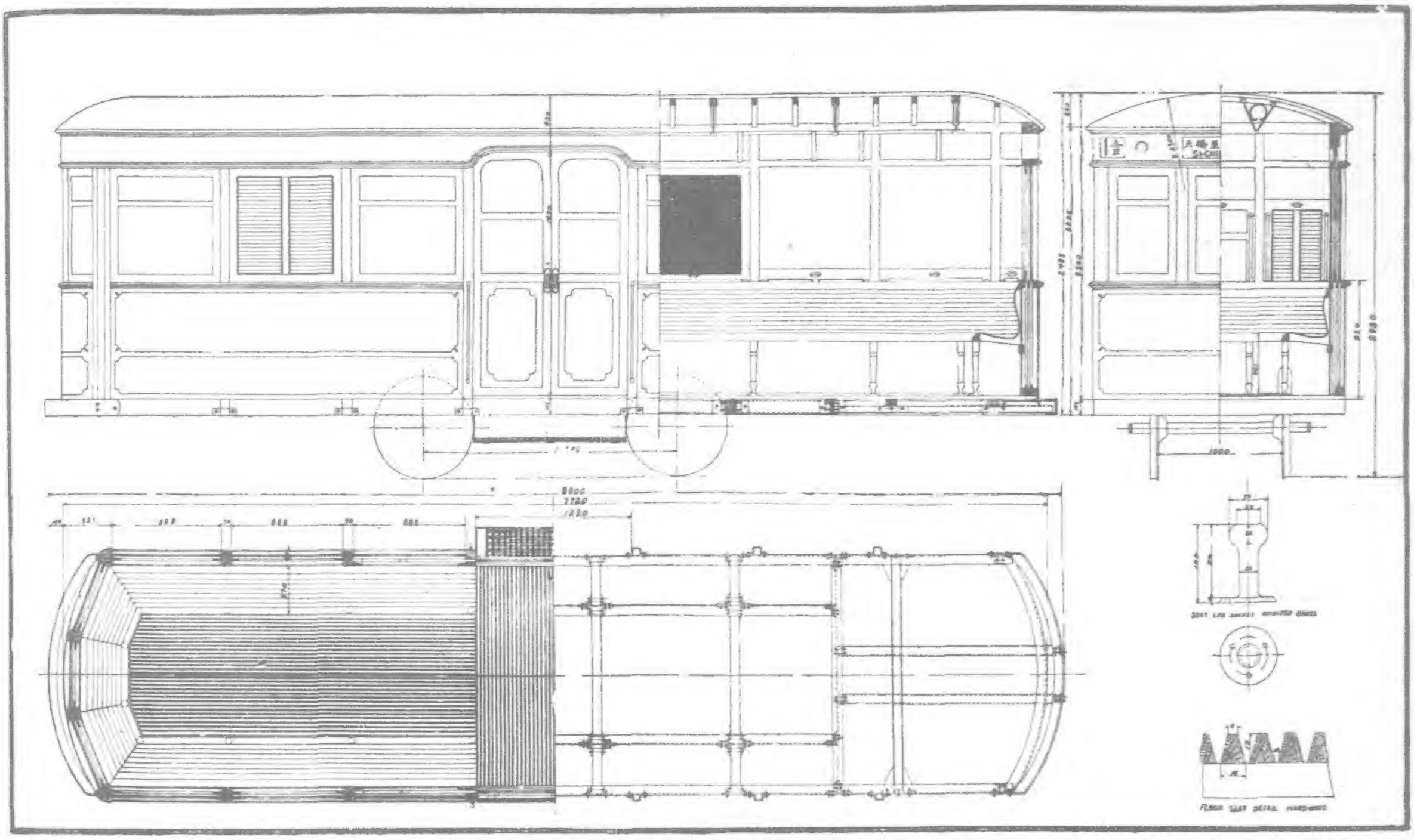
The workshops comprise blacksmith's equipment, two lathes, drilling machine, one 12-in. shaper, grinder, etc.

Transmission Equipment.—The high tension current of 33,000 volts is carried by two lines in parellel of 6 copper conductors No. 3 S.W.G. total length of 15.6 miles.

The system also includes one steel ground cable $\frac{7}{11}$ b.w.g. and signal line of $\frac{7}{13}$ b.s.



Map of Peking Tramway System



Plan of Trailer

The supply line from Tungchow to Peking follows the route of the railway, and is carried on reinforced concrete standards supplied by Brossard Mopin of Peking. On arrival at the transformer station close to Hatamen Gate the current is again stepped down from 33,000 volts to 5,000 volts, by a similar equipment to that installed at Tungchow, viz : 2 transformers of 2,725 k.v.a. supplied by the Swiss firm of brown boveri.

It is expected that the central power station thus outlined will be in full working order by the end of 1925, and in the meanwhile the current required for the tramway system is being supplied by the Peking Electric Light Co. in the form of a threephase current of 5,000 volt 50 periods.

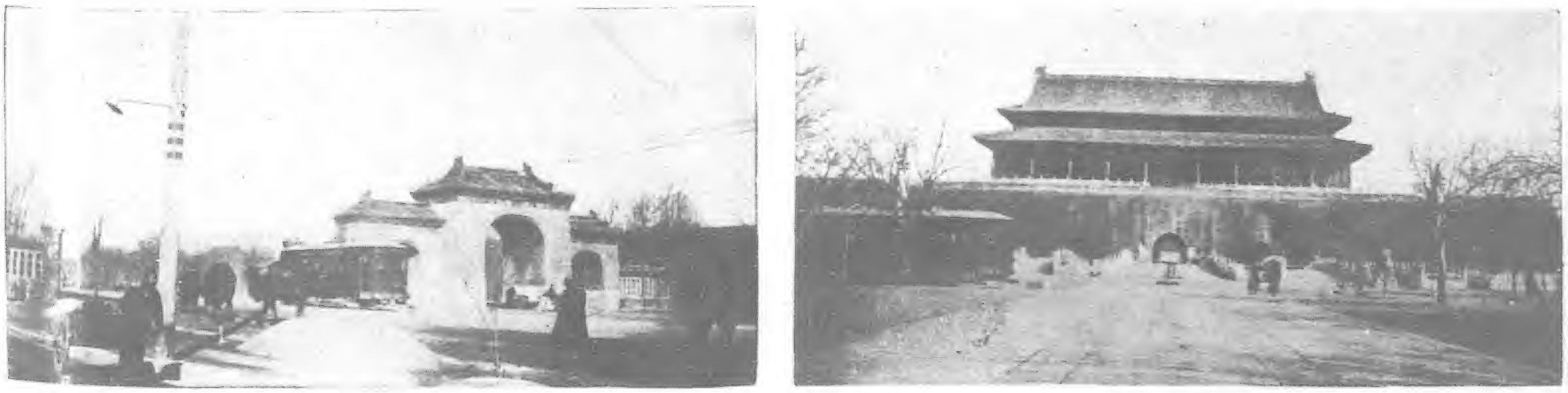
Inauguration of the tramway service, December 17, 1924.— This interesting ceremony took place in the presence of a large gathering of Chinese officials, governmental representatives, merchants, etc., and an auspicious start was made by the demonstration cars, which were immediately inundated by an enthusiastic public looking for free rides. After the first few days of trial trips the service settled down to regular business, and as the other traffic on the streets became accustomed to the sight the speed was gradually increased, in the hope that thereby any serious accidents might be avoided. It was obvious that a certain time would be required in order to educate the various kinds of traffic encountered on the streets of Peking to the changing conditions, for not only have the obstacles presented by camels, rickshaws, mules, funeral processions, pedestrians, etc., to be dealt with, but the inertia of the police and the the military has also to be overcome, for these latter seemed at first not to comprehend that a tramcar is a moving mass which is indifferent to the obstruction caused by a coolie in uniform, however important he may feel himself to be. It was really extraordinary to notice how, for the first week or two, a policeman or a soldier would step into the middle of the track and apparently expect the tram to go round him ; the subsequent unfortunate results being in the nature of a painful surprise.

In spite of several adverse conditions, however, the results of the first months of working compare very favorably with those in Shanghai when the trams were inaugurated there in 1908-1909.

Average of Monthly Running Reports.

	Peking	Shanghai
	1925	1909
Passengers carried	930,000	981,000
Car miles (net)	82,000	165,000
Passengers per car mile ..	11	5.95
Number of trams in service ..	30	55
Average payment per passenger	4.25 cts	3.86 cts.

As a general rule the receipts on the tramway systems in Chinese currency are in coppers, and the conversion of these into silver



The Old and the New

dollars occasions a very considerable loss, as the following figures will show :—

Loss on Exchange.

Year	Shanghai.	Peking.
1908	20%	
1910	24%	
1915	27%	
1920	26%	
1925	53.5%	64.2%

The original tariffs on the Shanghai tramways were reckoned in silver money, but during their development the conversion to copper occurred, no one apparently having foreseen the possible fluctuations in the currency which have since taken place. It is worth noticing here that this cheapening of the copper coinage is mainly due to a simultaneous debasement of the metal and lightening of the weight ; and that as the expenses of the tramway companies of Shanghai and Tientsin are chiefly in silver currency it became necessary for them to raise their transportation charges in order to keep pace with the depreciation in the receipts. With this in mind the Peking Tramway Company has fixed its charges in silver cents, but at the same time it has prepared a table of conversion rates for coppers into silver and this is affixed to all the the cars on the system.

It may not be out of place to present to the reader at this point some statistics with regard to tramways in operation in Europe, America and China, for purposes of comparison.

Number of Passengers carried per Mile of Route per Annum.

Glasgow	5,100,000
Manchester	2,570,000
Liverpool	2,900,000
Philadelphia	2,000,000
Chicago	2,460,000
Paris	2,200,000
Shanghai (S.M.C.)	7,000,000
Peking (from Dec. 18, 1924 to Feb. 18, 1925) ..	1,080,000

Car Miles run per mile of Route per Annum.

Glasgow	267,000
Manchester	170,000
Liverpool	197,000
Philadelphia	180,000
Chicago	217,000
Paris	194,000
Shanghai	300,000
Peking (since commencement Dec. 17) ..	100,000

Number of Journeys in Public Vehicles Per Head of Population per annum.

Glasgow	Population	1,200,000	404 journeys
London		7,300,000	413 ,,
Philadelphia		1,825,000	466 ,,
Chicago		2,700,000	482
Paris		3,000,000	517
Shanghai (International Settlement) ..		800,000	145
Shanghai (All Settlements and Chinesecity)		1,700,000	100
Peking (since commencement Dec. 17)		1,181,000	9.44

Length of Route Public Vehicles per 100,000 of population.

Glasgow	8.08 miles
Manchester	10.10 ,,
Liverpool	8.83 ,,
Philadelphia	22.22 ,,
Chicago	21.20 ,,
Paris	21.30 ,,
Shanghai (International Settlement only)	2.43 ,,
Shanghai (Including Chinese city, etc.)	1.86 ,,
Peking	1.69 ,,

These figures serve to show that in China the number of travellers in proportion to the population is much less than in Europe or America, but at the same time it must be recognized that trams as a means of locomotion are only just beginning in the Orient, and in the course of a few years it may be confidently predicted that the use of public vehicles will make immense strides.

In support of this argument one may quote finally some figures which show the progress made in Shanghai.

	Length of Route		*Rolling Stock*		*Passengers Carried.*	
Year	1909	1921	1909	1921	1909	1921
Inter. Set.... ...	16.3 miles	17.8	65 cars	182	11,000,000	120,000,000
French Con. ...	9.12 ,,	9.87	32 ,,	49	7,000,000	33,000,000
Chinese City ... (opened in 1913)	—	6.00	—	42	—	30,000,000

Better Trade in the Dutch East Indies

Only so short a time ago as last May the Governor-General of the Dutch East Indies, in opening the Volksraad Session, was deploring that the Government were still obliged to moderate their activities owing to the unsatisfactory condition of the market, and although he was able to see a slight improvement in the economic position, he expressed himself as still waiting for that permanent recovery of the financial balance which was before all things essential to renewed and invigorated progress. Things have moved with unexpected rapidity since then. For the first time since 1916 the Budget has shown a surplus instead of a deficit ; there has been a record crop of sugar ; rubber prospects are better than they have been for some time ; an actual boom has occurred in tea and coffee; and the tobacco sales have yielded results far in excess of any in the past. The results of these developments are shown in the fact that produce companies are paying good dividends, and that there is an improvement in the import trade.

Probably the most encouraging feature of recent months has been the revived interest in agricultural industries as a result of the more favorable prices obtained. There has been a general extension of tea and sugar plantations, and in the cultivation of agave fibre, while the Government have considerably assisted in these developments by the irrigation works which they have undertaken. All this is true not only of Java, but also of Sumatra, where agriculture is now making rapid headway, and what is being done in the larger, but hitherto less developed island, suggests a future which will add materially to the aggregate prosperity of the group and will mean a proportionate expansion in both import and export activities. Only the fear of taxation holds back the necessary capital for the full exploitation of the enormous natural resources of Sumatra.

Relatively little attention has so far been given to manufacturing industries in the Dutch East Indies, except those that are the direct offshoots of the natural products of the islands, as, for example, alcohol and arrack distillation, oil and petroleum refining, tin smelting, etc., but these are steadily advancing in importance and output, and are every day becoming larger purchasers of industrial plant. Here again the Government has come to the aid of enterprise by making available the water-power resources of the various districts. Apart from New Guinea, the water-power of which is still an unknown quantity, there is an available horse-power in the water courses of about 5,500,000, of which 3,000,000 are in Sumatra, 2,000,000 in Borneo, 1,000,000 in Celebes, and 500,000 in Java. At present something over 100,000 k.w. are generated at the power stations erected.

It is hardly necessary to point out that the improved conditions in the Dutch East Indies market are likely to renew the demand for better quality goods than have been purchased in recent years. The slump in regard to many of the products of the islands seriously affected the buying power of the population, and this showed itself particularly in the case of textiles, the demand for which, as a result of reduced circumstances, was directed almost exclusively to the cheaper grades, such as those offered by Japan. The last-named country, indeed, became the principal source of imports into Java of grey, printed, and dyed cotton piece goods. It may be expected that increased purchasing power will cause many of the importers to renew relations with British and American firms, and thus improve their stocks not only in quantity but in quality. Of course, many of these relations have never been severed, most of the leading import houses being closely in touch with British firms, not only as a result of business transactions extending over many years, but in some cases as a result of capital investments.

Great Britain's direct share in the import trade of the Dutch East Indies is relatively small, being in 1923, the last year for which statistics of this character are available, only 14.7 per cent. of the total. But in addition 16 per cent. of the imports came from the Straits Settlements and the Federated Malay States, and it may be safely ventured that a large proportion of trade *via* Singapore was of United Kingdom origin. Besides this, 4.3 per cent. of the purchases came from Australia and New Zealand, so that altogether 35 per cent. of the total imports of the Dutch East Indies was derived either from Great Britain or from the British Empire. The 14.7 per cent. representing the direct imports from the United Kingdom amounted to a value of over £9,000,000, and the figures for the nine months of 1924 encourage the expectation that the full trade for the past year will considerably exceed that amount.

Bird's-eye View of the Business Centre of Greater Osaka

GREATER OSAKA

GREATER Osaka celebrated its prosperity with an exposition which was opened on March 18. In the course of his address, President Motoyama said :

"The metropolis is the cradle of a country's culture. I am confident that people of Osaka will live up to the expectation of the rest of people in their contributions to the development of the national wealth, realizing the heavy responsibilities placed upon their shoulders in carrying out the plans and ideals of Greater Osaka.

"The opening day of the Exposition, under the auspices of the *Osaka Mainichi*, should therefore be congratulated not only by the people of Osaka but also by the nation itself. May the *Osaka Mainichi* always be at the call of the city, and of the nation, encouraging, promoting, and developing industry and commerce and the nation's prosperity."

"The greatness of a municipality should not be measured merely by its population nor by its area. It must be judged by the quality and perfection of all its civic enterprises and institutions. The *Osaka Mainichi* has heretofore contributed greatly to these requirements, and, what is more, has now collected important data, showing all the activities of the city scientifically presented in the Exposition."

Mr. Takahashi, Minister of Agriculture and Commerce, sent a message to the following effect :—

"The destiny of a nation is chiefly dependent on the prosperity of its industries. Hence, it is most fitting and proper for the nation that an influential newspaper like the *Osaka Mainichi* should undertake this civic enterprise, pointing the direction in which the people, not only of Osaka, but of Japan, should go.

"The Greater Osaka Exposition, surely, will contribute immensely to the encouraging of the industries and business of the nation. On this account, I take great pleasure in expressing congratulations on the opening day of the Exposition."

Osaka, known as the Manchester of the Orient, because of its popularity as the cotton manufacturing centre of Japan and the Orient, has become the largest city in the Orient and fifth in rank among the cities of the world in point of area. By annexing the two adjoining "gun," Higashinari and Nishinari, the total area

Head Office of the Nippon Menkwa Kabushiki Kaisha

Harbor Construction-Jetty, Osaka

The Osaka Commercial Museum

of Greater Osaka becomes 65.75 square miles, and the population 2,030,000. Formerly the city's area was only 20.82 square miles and its population 1,390,000. Osaka is larger than Manchester now.

Higashinari and Nishinari guns comprise 44 towns and villages, covering a total area of 42.93 square miles and possessing a population of 642,000. By far the greater part of the area which was consolidated into Greater Osaka is at present devoted to farming. Therein lies the significance of the consolidation, for the Manchester of the Orient keenly feels the need of open space to build factories, and the two guns which have afforded space for that purpose in the past will do so in future, with modern improvements added by the efforts of the municipality of Greater Osaka.

Osaka Cotton Spinning Company. One of the Typical Factory Buildings in Osaka

The city of Osaka was formerly divided into four wards: Kita, Higashi, Nishi, and Minami; or North, East, West and South. But in Greater Osaka, these four wards have been subdivided, creating in all eight wards, namely: Kita, Konohana, Higashi, Nishi, Minato, Tennoji, Minami and Naniwa.

In addition to the foregoing wards, five new ones have been created in the area consolidated into Greater Osaka, namely Higashinari and Nishinari. The five new wards are known as: Nishiyodogawa, Higashiyodogawa, Higashinari, Sumiyoshi and Nishinari. Nishiyodogawa-ku comprises Dembo, Sagisu, Utajima, Chibune, Hiejima Fuku and Kawakita. Higashiyodogawa-ku comprises Nakatsu, Toyosaki, Nishi-Nakajima, Toyosato, Omi-chi, Shinjo, Nakajima, Kita-Nakajima and Kamitsu. Higashinari-ku comprises Ikuno, Tsuru-hashi, Nakamoto, Kamiji, Shoji, Joto, Enomoto, Namazue, Enami, Johoku, Furuichi and Shimizu. Sumiyoshi-ku comprises Tennoji, Hirano, Kizure, Kita-kudara, Tanabe, Yosami, Nagai Sumiyoshi, Sumince, Anryu and Shikitsu. Nishinari-ku comprises Imamiya, Tamade, Kohama, Tsumori.

From the point of view of what used to be Osaka City, there are two reasons for which the consolidation of the outlying districts into Greater Osaka was considered absolutely necessary; readjustment of the streets and sanitary improvement of outlying districts to prevent disease. These two problems are not easy to solve, as their solution will require a considerable outlay of funds and a deal of inconvenience spread over a long period of operations. Nevertheless, they must be solved, for, should the irregular development of the outlying districts continue, Osaka City will be literally choked by menacing diseases and by inconvenience in communications. As an organic community, Osaka must break through these walls

The Osaka Municipal City Office

The Osaka Branch Bank of Japan

to preserve its health. These considerations led to the plan of consolidation.

As for the districts consolidated into Greater Osaka, they will naturally get the benefit of the municipal improvements extended to them. These self-governing communities were requested by the Home Office, through the Osaka Prefectural Government, to reply as to whether they cared to be consolidated into Greater Osaka and on what conditions they would join. Very little dissension was forthcoming.

As soon as these districts made their reply, the Home Office gave formal consent to the plan of consolidation and preparations for creating Greater Osaka was made at once. And from April, 1925, Osaka announced its expansion into Greater Osaka.

There are several interesting facts which should be noted in connection with the creation of Greater Osaka. Greater Osaka has within its limits 5,132 *chobu* (a *chobu* is equal to 2.45 acres) of rice fields and 1,912 *chobu* of track gardens. The city is not only a manufacturing and commercial centre, but an agricultural city as well. About 86,000 *koku* (a *koku* is equal to about 40 bushels) of rice and 9,000 *koku* of wheat will be produced. Being adjacent to Osaka City, the outlying districts produce a considerable amount of vegetables, chickens, eggs and other farm produce.

There are 6,600 families engaged in chicken raising, with 240,000 chickens, yielding annually 6,430,000 yen. These farming districts will be converted, in a space of five or ten years, into city streets or manufacturing sites, according to how fast Greater Osaka develops.

According to the plans in the minds of the promoters of Greater Osaka, purely agricultural districts in the highlands, east of Osaka City, are sites for future residence districts, as a way of relieving the present crowded and unsanitary condition of residence houses in the city.

The regions along the Yodo and Kizu Rivers have been specially selected as sites for big and special factories, which will be removed from their present sites within the former city limits, thereby increasing the efficiency of the factories and at the same time safeguard the lives of the people of the city, who are at present tormented by the smoke, noise and malodours of the factories.

The improvement of sanitary conditions in the city was one of the objects for which Greater Osaka was planned. Osaka's death rate is beyond description. Its rate of 22.-32 per thousand of the people of Osaka is the highest of the six largest cities in Japan, except Nagoya. The rates in some of the outlying districts are extraordinary. In Ikuno-mura, it is 57.03, in Toyosaki Machi, 33, and in Imamiya Machi, over 38.

An example of improvement is shown by Imamiya, where the rate in the part of Imamiya which was incorporated into the former Osaka City some years ago is smaller by 11 than that of Imamiya Machi, which was left behind, but which is now consolidated into Greater Osaka. In Tennoji, the difference is 1.4. By rates similar to these examples, the sanitary and health conditions of the outlying districts will be improved.

All these and other improvements which may be enumerated can be brought about only if the people of the city and of the districts incorporated into Greater Osaka address themselves seriously to the great task before them. The increase of area alone will not make for a great city. There must be modern civic improvements carried out in order to make Greater Osaka worthy of its name.

Side by side with the proposed plan of Greater Osaka, the city has a plan to construct broad streets which will run in four directions, in order to relieve the present congestion of traffic.

The narrowness of the streets in Osaka, as in other cities in Japan, has been an obstruction to the proper development of modern enterprises in industry as well as in other lines of human activity. Moreover, if a natural accident, such as an earthquake which would shake the city from its foundations should visit the city followed by a big fire (Osaka is famous for fires), the present condition of the streets is entirely unsatisfactory in affording the people sufficient right of way to escape to places of safety.

MAP OF GREATER OSAKA

Already plans have been mapped out by the city authorities for the construction of wide streets, which will be carried out as soon as the needed funds are secured.

With the wealth and latent economic and financial strength of the city, there is no reason why the plans mapped out cannot be carried out, if the people address themselves seriously to the problem.

There is also a plan of constructing rapid-transit means of travel in the city, either elevated or underground, in order to relieve the present street car congestion. The suburban electric car lines, such as the Hanshin, Hankyu, Nankai, Keihan and others in existence, as well as those planned, are contemplating improving their service by reconstructing the lines in the city.

Their plans have not progressed very fast as yet, due to legislative difficulties presented by the municipal assembly, but as soon as these and other natural impediments are overcome, means of locomotion to and from Osaka will be greatly improved.

Last, but not least, is the fact that the Imperial Railway Office is now carrying out a plan for rebuilding Osaka Station at Umeda into the finest railway station in the Orient. Acres of

property adjoining the present station at Umeda have been purchased, the buildings standing thereon are being demolished, and engineering work is fast progressing. Within a few years Osaka's front will be decorated with a first-class railway station worthy of the largest city in the Orient.

Nozomu Nakagawa, the Greater Osaka Governor

History of Osaka

Osaka, known in ancient times as Naniwa, is the largest city of Japan, and it has taken the foremost rank as an industrial and commercial centre from very early times, now having a population of about 2,030,000.

On the west the city looks out upon Osaka Bay, and on the east it is walled in by the mountain ranges of Ikoma. The city covers 65 square miles, and is easily reached from Kyoto, the former Capital, which is 27 miles north-east and also from Kobe, one of the leading sea-ports in the Empire, which is 20 miles west.

The development of Osaka may be said to have originated in the River Yodo, which rising in Lake Biwa, empties its water into Osaka Bay traversing the heart of Osaka. At the mouth of this river the busiest scenes are presented by the thousands of coastwise vessels and junks, coming and going from and to all parts of the country, and laden with an endless variety of domestic products. The river is connected with numerous canals extending to a total length of 40 miles, and affords great convenience and exceptional commercial advantages.

It was here that the first historically recorded Emperor of Japan, Jimmu Tenno stayed on his way to Yamato, and the place was called Naniwano-Saki. This, according to Japanese Chronology, was over 2,580 year ago.

In these dim and semi-mythical times Osaka, or Naniwa, as it was then called, began its career as the centre of communication and transportation and it has never lost its chief characteristics as a commercial city.

Nintoku, the 16th Emperor (A.D. 313-399), made the city his capital, and constructed many public roads leading to different points and also opened new canals with the sole desire to develop and prosper the city. Many beautiful stories are told of this benevolent Monarch.

Buddhism was introduced soon after, and the Shitennoji Temple, an old edifice to be associated in fame with the Horyuji Temple of Yamato was built at Osaka by Prince Shotoku (593 A.D.). Through the introduction of this new religion Japan came into closer relationship with China and Korea, and Osaka was made the port for passengers from those countries, and it was at this time that a reception hall named the "Korokan" was built for the purpose of entertaining diplomats and ambassadors from China and Korea.

The real foundation for the present prosperity and importance of Osaka, however, must be ascribed to the personality of that great hero, Toyotomi Hideyoshi (1536-1598 A.D.). He was born in the midst of a feudal period. After fighting many battles he at last became active ruler of the Empire, and built in this city the famous Osaka Castle (1585 A.D.), making it his permanent base, and the city begun to prosper as the leading city of Japan.

Later the distinguished hero was succeeded by Tokugawa Ieyasu, the remotest ancestor of Prince Tokugawa Iesato. Ieyasu selected Edo, the present Tokyo, as his base; and consequently the centre of military affairs and administration was removed to Edo, but commerce and industry continued to prosper in Osaka.

In those days the Daimyos (feudal lords) sent to Osaka the products of their districts to be disposed of, or raised money on their products from prominent merchants of the city. For this reason even the Daimyos were obliged to bend their knees before the Osaka merchants. The city thus developed as an independent, economical centre and kept aloff from Feudalism. This historical fact is a source of great pride to the City of Osaka.

As to arts and learning, Osaka produced not a few great persons during this era. During the Restoration (1868), in the China-Japan War and Russo-Japan War, Osaka performed its great mission both economically and politically. With the advancement of time, Osaka has continued to develop in every respect as shown by its present prosperity.

Here are all the industries needed to supply China, Korea, the South Sea Islands—in all those regions where the goods of Osaka find a market because of their goodness and cheapness.

One of the officials of Osaka, who has been of the greatest service to the city, is Dr. Hajime Seki, present Major, who succeeded Mr. Shiro Ikegami last year. Mayor Seki was formerly an official of the Education Office, but his great administrative ability forced him to forsake the educational field and cast in his lot with the municipal administration of Osaka.

For a time he was long a Deputy Mayor under former Mayor Ikegami, and his services for the municipalization of the Osaka Electric Light Company are still fresh in the memory of Osaka citizens. Since he became Mayor last year, he has been endeavoring to make the city the centre of the nation's life, by perfecting various municipal establishments and by persuading the Central Government officials to grant autonomy to the various phases of Osaka's administration.

Greater Osaka, now completed, certainly bear testimony, to our gratitude, to the administrative ability of this tireless civil servant—this scholar and statesman—Mayor Seki.

Hajime Seki, Mayor

Osaka Harbor

The Oriental trade of our country is chiefly carried out through Osaka harbor. The Municipality is improving and enlarging the harbor and when all the quays, docks and landing facilities, now planned are completed it will meet all the requirements of modern trade, and place Osaka, in another decade, in the forefront of Japanese ports. The inception of Osaka Harbor dates back to 1872, though the work did not really begin until 1897.

Beginning with entrance from the sea the visitor should inspect the Harbor which cost over fifty million yen. This harbor gives Osaka the equipment of a first-class port and it places her in a position to deal directly with the markets on the continent of Asia and elsewhere, where goods manufactured in the city are exported.

The number of foreign ships putting to Osaka harbor is gradually increasing, According to investigations by the Osaka Customs House the total number of foreign bottoms entering Osaka harbor last full year was 18,012 and the gross tonnage 4,533,314 tons, an increase of twice in number and over three and a half times in tonnage, in comparison with 1920. The total tonnage of foreign goods was 1,983,131 tons an increase by over three and a half times, compared with 1920.

Another boost to the expansion of Osaka is an announcement just made that Osaka port will have, in 1926, two new gigantic piers, with a combined capacity for the accommodation of eight 10,000-ton steamers.

The announcement further states that the piers, when completed, will have up-to-date loading and discharging facilities; special attention is to be paid to railway yarding and trunk line connections. In all, Osaka will have, in 1926, one of the best port facilities in Japan.

Katsutaro Inabata, President of the Osaka Chamber of Commerce

The work on the piers has been going on ever since 1918, when 1,575,000 yen was appropriated for improvements to Osaka harbor. Progress at first was slow on account of changes in plans, but the rough foundation work is finished and the piers can now be clearly

seen rising from the water. With the first stage of the construction work finished, those in charge are now positive that the whole job will be finished in 1926.

During the past 38 years, since the Osaka Electric Light Co. was first established, the number of electric lights has increased from 150 to 2,150,000 in and around Osaka. This is surely big progress, although there are so many needed things in the service yet to be accomplished.

There are ten Telephone Exchanges in the city of Osaka, *viz.*, Honkyoku, Higashi, Nishi, Minami, Kita, Tosabori, Shimmachi, Sakuragawa, Ebisu and Semba. There are more than 50,000 telephones, and automatic telephone boxes everywhere in the city.

The waterworks of Osaka were first built to supply a population of eight hundred thousand, but when the population had increased to over nine hundred thousand, an enlargement of the works was found necessary.

After that the Municipality entered upon a big undertaking, with a scheme to supply a population of a million and a half with 3.5 cubic feet of water daily. The estimated expenditure for the enlargement was ten and a half millions.

The Yotsubashi (Bridge), Osaka

The best machinery in the world imported from England is now in use at Osaka Waterworks, and the city is more favorably situated in regard to water supply than any other in the country. Visitors desiring to inspect the reservoirs and works must apply to the city office for permission.

With a population that is steadily increasing at the rate of fifty thousand a year, it is not difficult to predict the future of Osaka as a distributing centre. Had the city been contented

The Office Building of the Kawakita Denki-Kigyosha, Osaka, Japan

7 Offices of the Osaka Iron Works, Limited, at Osaka

with its old accommodation as a port it would have probably still continued to occupy the important place it has always occupied as a centre of distribution for the domestic trade, seeing that its advantage lies in its central geographical position and in its admirable service of waterways and other communications. But the enterprise of the citizens in equipping themselves at great expense with a modern port ought to be rewarded by a commensurate expansion of the foreign trade. The great market for Osaka goods lies on the Asiatic mainland and in the South Sea Islands, although of late years there has been a steady development in trade with North and South America and Europe.

But Osaka's future clearly lies in supplying the immense Asiatic population across the sea with cheap goods, and to do a direct trade between Osaka and the ports of the mainland is the aim of its citizens and the object for which the port was built.

Contract from Karachi Port Trust

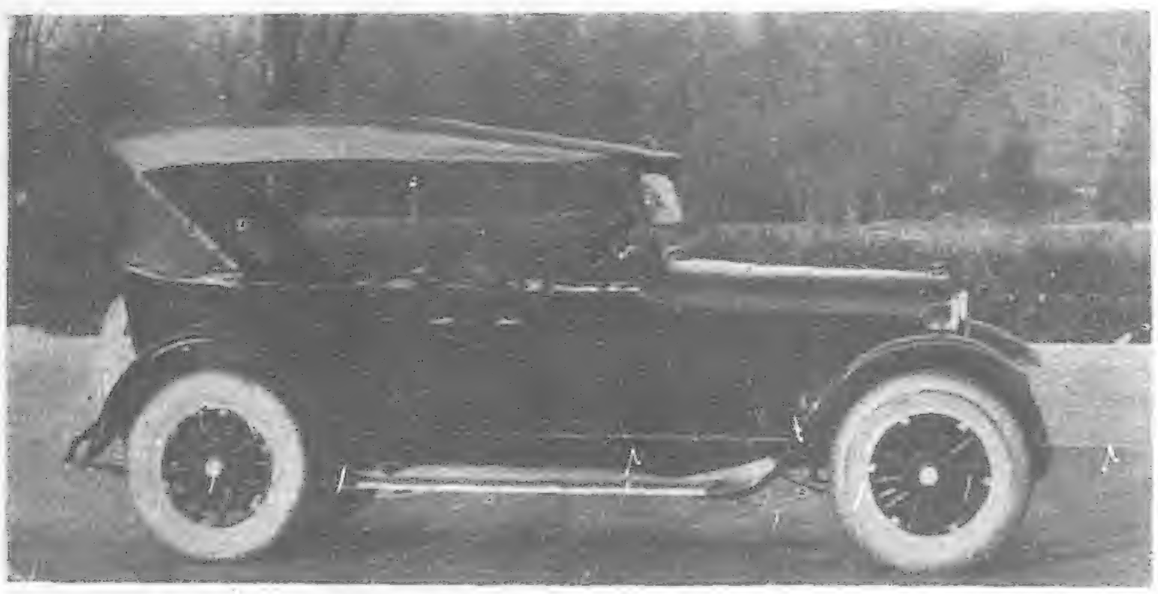
A powerful shore discharge two pump plant, boilers, and engines have been ordered from Messrs. Lobnitz & Company, shipbuilders, of Renfrew, Scotland, by the Karachi Port Trust.

New Seaplane for Dutch East Indies

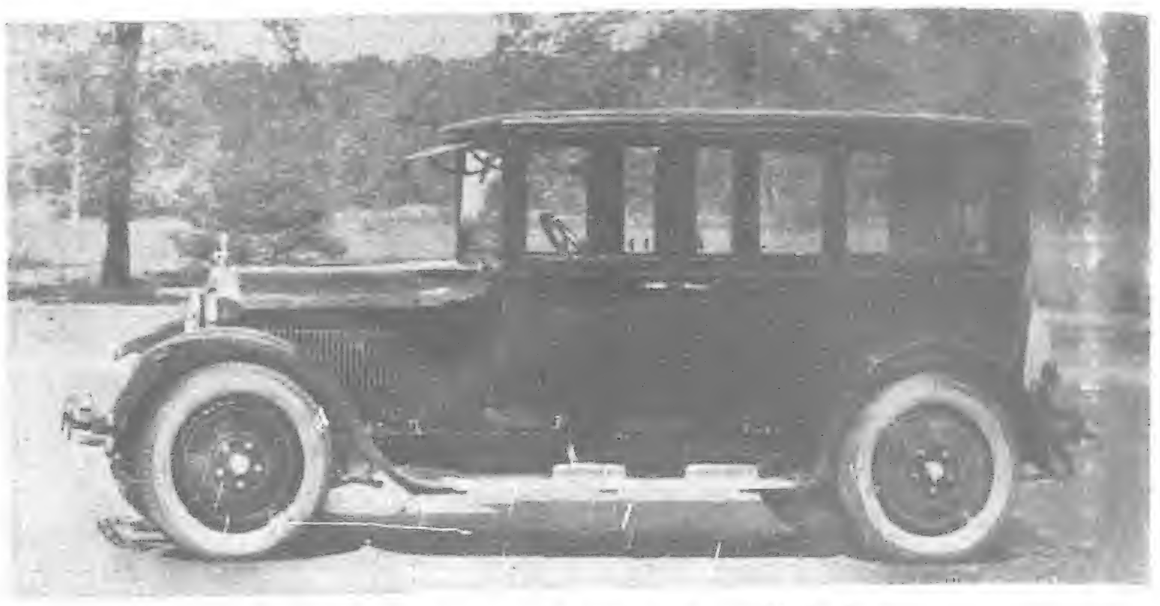
The Fairey Aviation Company have just received an important seaplane contract from the Dutch Government for machines required for use in the Dutch East Indies. The contract was obtained in competition with the whole world, including the Fokker Company of Holland.

New Post Office for Singapore

The new General Post Office at Singapore, which is being constructed of concrete, will be another outstanding feature in the history of construction in the Orient. A fine plaster model of this new building was exhibited in the Malayan Pavilion of the recent Empire Exhibition at Wembley. The building will, it is estimated, cost approximately £1,000,000, will stand on two acres of land, and will, when completed, be one of the finest buildings in the Far East. It will not only be the home of the Post Office but will also house the Singapore Club, and a large number of palatial business offices. The principal facade is 446-ft. long with a maximun width of 204-ft., the total height being 138-ft. In order to distribute the load so as not to exceed one ton per foot super, the foundations of the building comprise a rectangular reinforced concrete raft. Architectural features are receiving special attention, and external facings are of a special synthetic stone, made from granite chippings and white cement.



Dodge Brothers Touring Car



Dodge Brothers Special Type B Sedan

Best Year For Dodge Brothers

Gain 35.6 Per Cent. Over 1923 in Face of General Decrease: General Sales Manager Nichols Credits President Haynes for Progressive Policies

THE year 1924 was the most successful in the history of Dodge Brothers, according to company executives.

While the automobile industry as a whole showed a production decrease of 8 per cent. for the first ten months of the year, compared with the same period for 1923, Dodge Brothers increased their production and sales 35.6 per cent.

The figures for the remaining two months of the year will show about the same percentage of gain, according to John A. Nichols, Jr., general sales manager.

"It will be recalled that 1923 was the banner year of the industry," Mr. Nichols added. "Prior to 1924, it was also Dodge Brothers best year and in view of this, our large increase last year is especially noteworthy.

"It is not exceptional for a small company, or one that is just getting under way in business, to make such an increase. But for Dodge Brothers, who stand among the three or four largest motor car manufacturers in the world, to advance so sharply over an extra good previous year, is conceded by all authorities to be actually remarkable.

"Bear in mind that every year of their history has been a good year for Dodge Brothers. There have been no ups and downs—only consistent gains. These facts contribute to the unusualness of the achievement.

"Our 1924 shipments to dealers aggregated 225,104 cars, of which 193,861 were of the passenger type and 31,243 commercial.

"Practically this entire total represents retail sales, as dealers stocks at the close of the year were unusually low.

"Dodge Brothers ended their tenth year with a total of 1,250,000 cars built and sold. Registration records show that more than one million of this number are still in daily service, giving some idea of the materials and methods employed in building the car.

"Public confidence in Dodge Brothers product was never greater. Respect and admiration for the car's long life, dependable performance and comfortable riding qualities are universal.

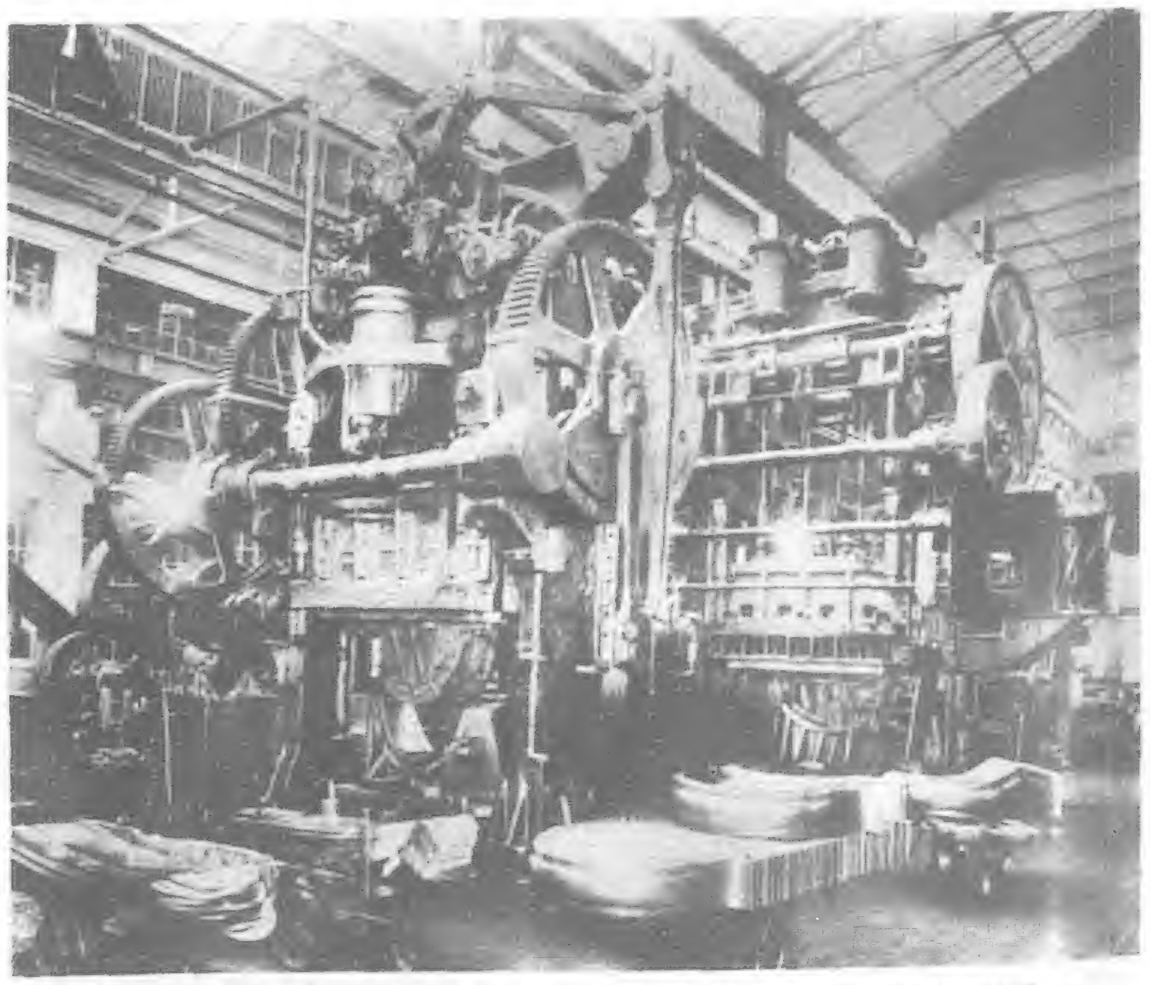
"It is this public confidence, coupled with constant, diligent improvements in the car, that accounts for Dodge Brothers increased business in the face of a general decrease.

"Chief credit for this gratifying showing belongs to Dodge Brothers president and general manager, Mr. Frederick J. Haynes. There has been a steady, healthy growth in production every year during his administration. The factory has been greatly enlarged, much new equipment has been installed and many better methods of manufacture have been adopted.

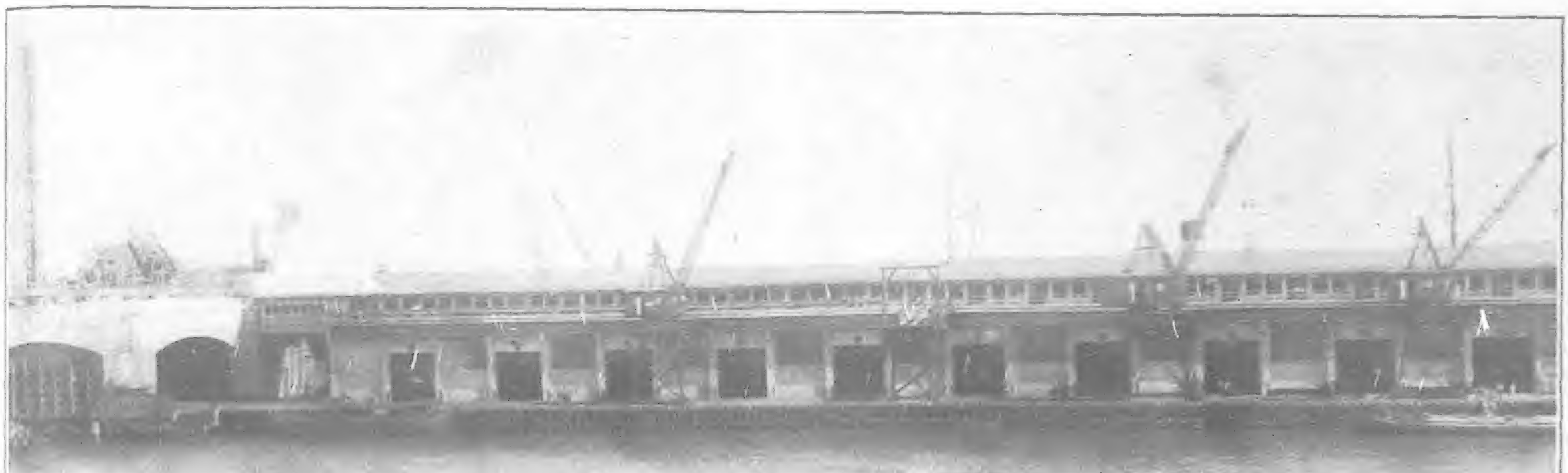
"In addition, pronounced impovements have been made in the appearance and riding qualities of the car, adding greatly to the appeal of a well-built product.

(Continued on page 184.)

Machining Dodge Brothers Cylinder Blocks. Careful, Accurate Machining of the Dense, Close Grained, Strong Cylinder Castings Contributes to the Unusual Life for which Dodge Brothers Engine has always been so well-known



Making Dodge Brothers Fenders. Each Formed in a Giand Press from a Single Piece of Heavy Gauge Steel



Partial Side View of Pier No. 7

Large Reinforced Concrete Ocean Terminal Nearing Completion at Port of Manila

Driving of Concrete Piles 24 Inches Square and 110-ft. Long, Involves Construction of Worlds Largest and Most Powerful Floating Driver of Special Design

By E. C. Earle, Chief Designing and Port Works Engineer, Bureau of Public Works, Manila
Vice Chairman, Manila Harbor Board

NOTABLE FEATURES OF CONSTRUCTION.—Concrete piles 24 inches square, 110 feet long, driven to sustain 110 ton loads. Largest and most powerful floating pile driver ever constructed required to drive the piles.

Special field equipment used for casting, lifting and transporting piles.

FEATURES OF DESIGN.—Novel features for caring for passenger traffic embodied in structure.

Special interior and exterior electric cargo handling equipment.

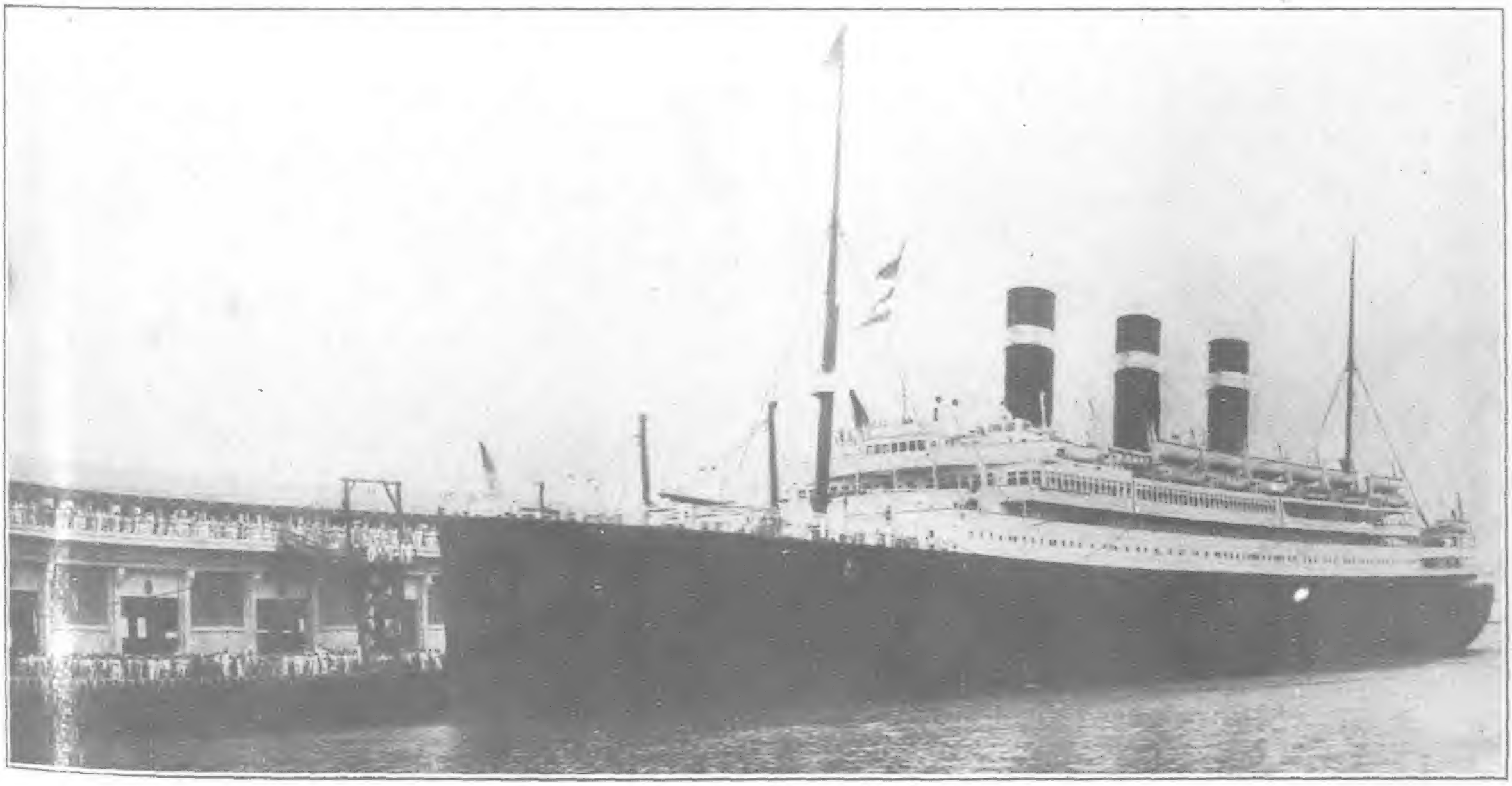
Roof trusses of long span designed to carry interior cargo handling cranes from suspended runway—maintaining large clear floor space on cargo deck of pier.

Wide aprons provided to handle cargo over.

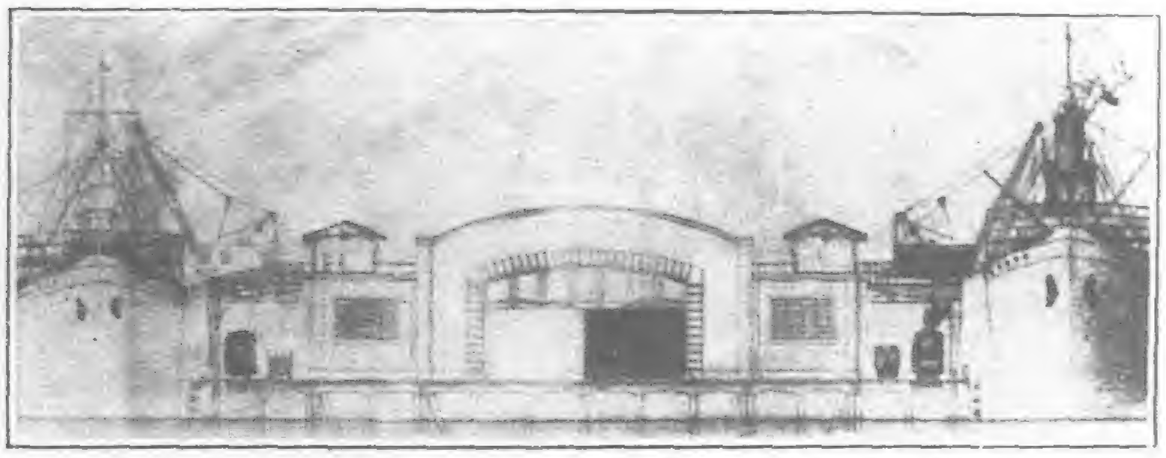
Unique fender system equipped with heavy buffer springs.

A large reinforced concrete pier now under construction at the Port of Manila, Philippine Islands is nearing completion. One half of the structure was commissioned July 7, 1924 and it is plained to open the entire structure about the latter part of this year. About 2,600 large concrete piles are being driven on this project.

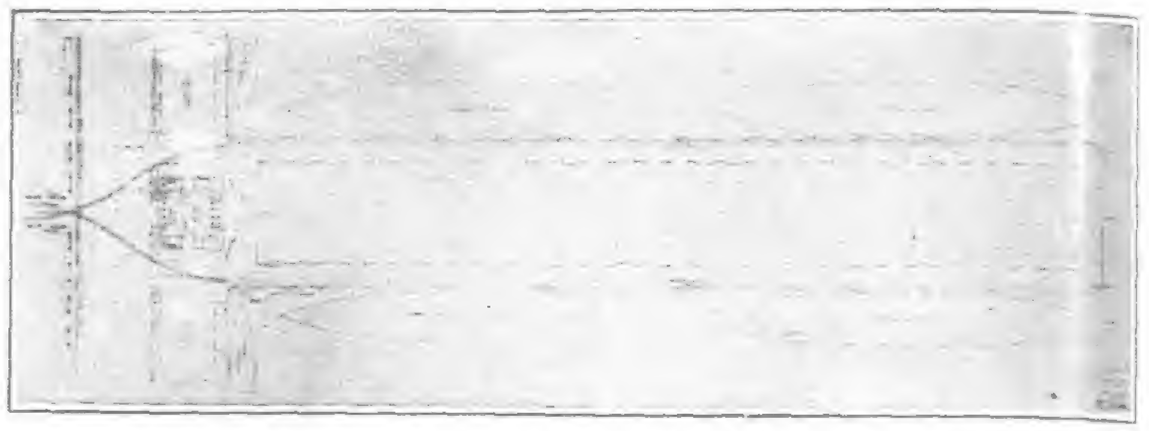
The outstanding features of interest of the project are the use of exceptionally long heavy reinforced concrete piles—24 inch square by 110 feet long, weighing 32 tons—and the special equipment being utilized in handling and driving the piles; each pile being driven to safely support a load of 90 to 110 tons.



S.S. "Belgenland" Berthing at Pier No. 7



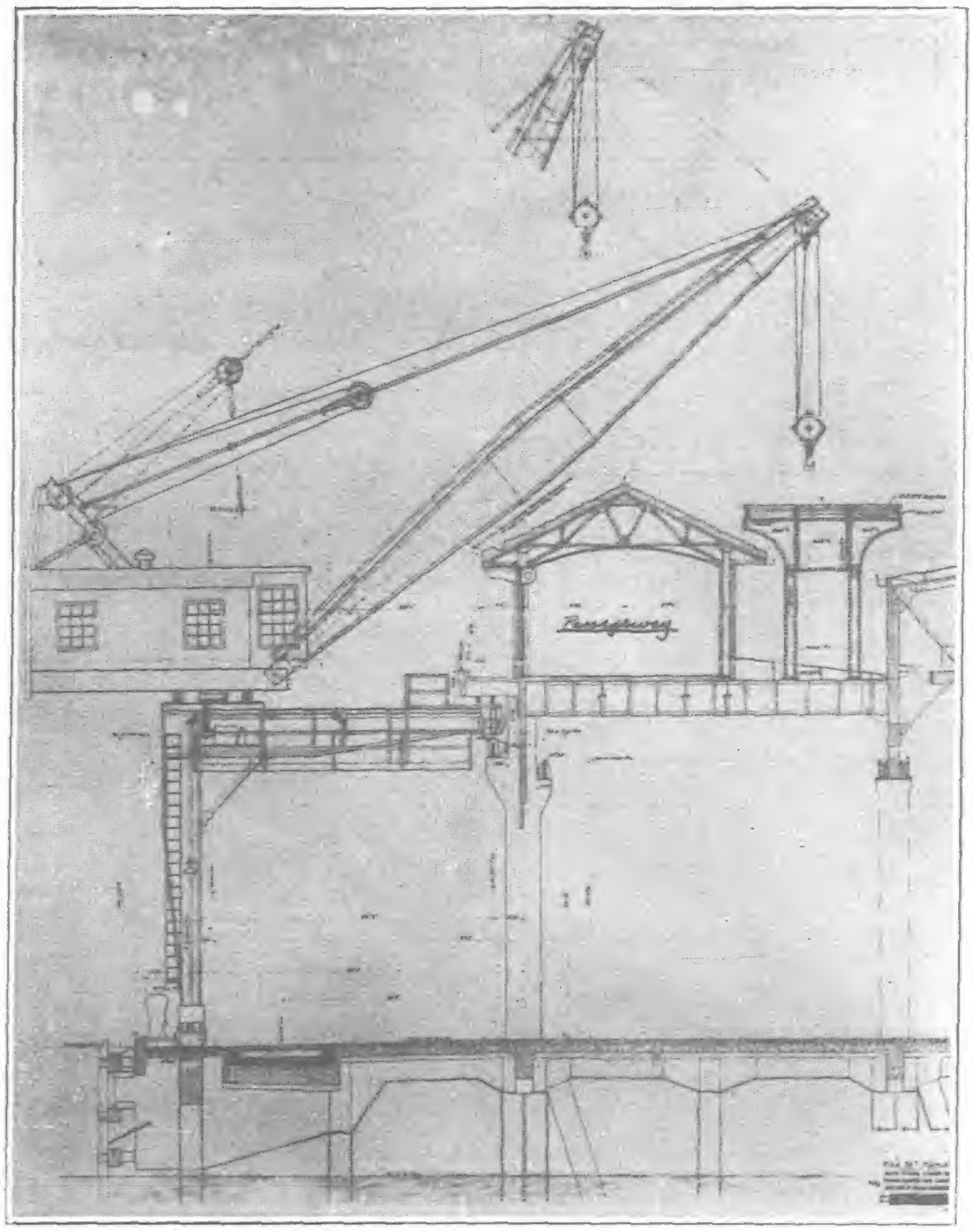
Sectional View of Pier No. 7 (Behind Pier head)



General Layout of Cargo Deck, Pier No. 7

PORT IMPROVEMENTS TO COST $20,000,000.—The construction of the new pier (Pier 7) at Manila is the first of several projects which the Insular Government plans to carry out in connection with the proposed program for the improvement of the PORT OF MANILA, including the construction of two new modern piers, the reconstruction and enlargement of existing piers, the construction of marginal wharves, cargo sheds, and oil and coal depot, the extension of the breakwater, etc., including the deepening of the harbor to 40 feet in the SOUTH PORT DISTRICT.

GENERAL DESCRIPTION OF PIER.—The new terminal structure is 234 feet wide and its length when completed will be 1,400 feet. It is equipped throughout with modern mechanical facilities for the rapid handling of a miscellaneous cargo. The pier shed proper is 160 feet wide and 1,253 feet long. Aprons, 36 feet wide extend out on each side to the fender system. Railway tracks are being provided on each apron.



Sectional View Through Apron and Passenger. Passageway Pier No. 7

A novel feature which has been incorporated in the design of the structure is the overhead passage-way on both sides of the pier. The usual exposure of passengers to risks encountered in passing through the more or less dangerous areas utilized for trucking, and the storage and handling of cargo is completely avoided on this pier. Ships decks are reached by ascending stairs or using elevators situated within the Pier Head on both sides of the waiting room, and by then passing through either the North or South passage-way and over the connecting and plank to the ships deck.

The floor system throughout the pier is of concrete and of the slab and girder type. All walls and columns are also of concrete. The roof over the main shed is of galvanized iron—supported by steel trusses, while the roof over the passage-ways at the second floor level is of tile on steel trusses.

The shed is well ventilated and lighted by continuous top hung movable steel sash running the entire length of the structure and electrically operated, while fixed steel sash lights every alternate panels of the shed wall. Steel rolling doors 18 by 20-ft., both electrically and manually operated have been installed in alternate panels, of the shed wall, with provision for inside and outside controll.

The fender system, built entirely of mountain dungon which is highly resistive to the ravages of marine borers of these waters, is supported by and slides on heavily reinforced concrete brackets. Large spring pots, each fitted with two heavy double coil springs capable of resisting 50 tons per set when fully compressed, are located above and below each bracket.

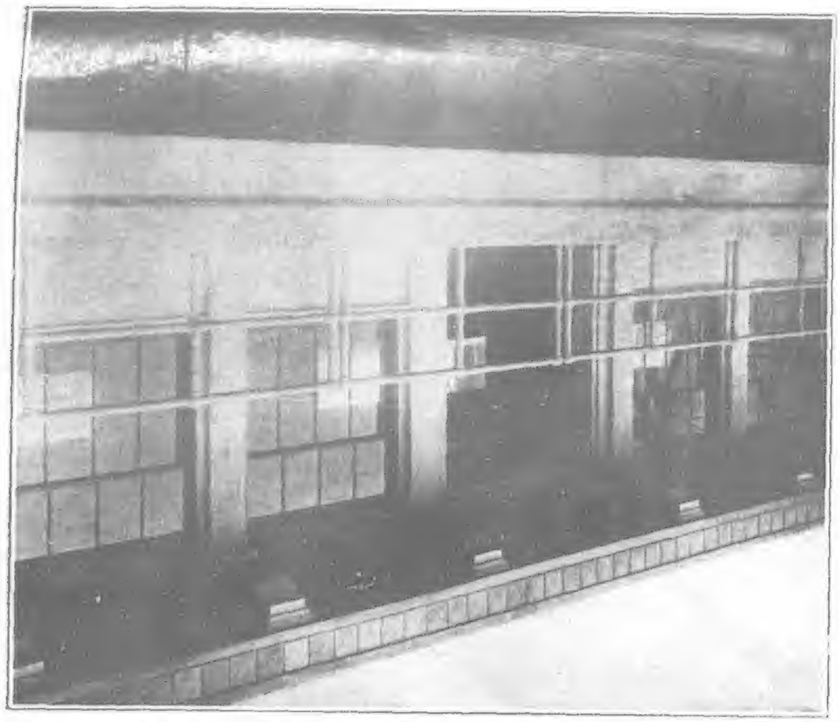
The pier head consists of a three floor central building and two entrance wings; the latter simply forming a covered connection between the pier shed, the pier head and the adjacent cargo sheds or latterals. Waiting rooms, baggage room, Customs and other offices are located in the central portion of this building.

CARGO HANDLING FACILITIES.—The mechanical equipment for the rapid handling of cargo on the pier will consist of 16 electric travelling semi-portal gantry cranes of the jib type, (14-2 ton and 2-15 ton)8 being situated on each side of the pier; a flexible system of 48 interior 2 and 3 ton overhead electric cranes; a fleet of industrial tractors, trailers and elevating trucks, and other usual auxiliary equipment such as portable conveyors, stackers, etc. Six gantry and 24 interior cranes have already been installed.

SUBSTATION — ILLUMINATION.—Current for the operation of all cranes and other cargo handling machinery as well as for illumination is brought to the substation at the centre of the pier at 3,300 volts. Here it is stepped down through a battery of transformers to 160 volts (for cranes) and is then converted by synchronous converters to D. C. and put on to the feeders at 260 volts. Two 350 k.v.a. synchronous converters take care of the present loads, however the complete installation will consist of 4 machines of this capacity.

Special care has been taken to provide excellent illumination for the operation of the pier at night, as the efficient handling of a miscellaneous cargo with rapid electric cranes and other cargo handling equipment depends, to a great extent, upon proper lighting. Standard lighting units have been distributed so as to give an almost uniform intensity of approximately $2\frac{3}{4}$-ft. candles throughout the shed.

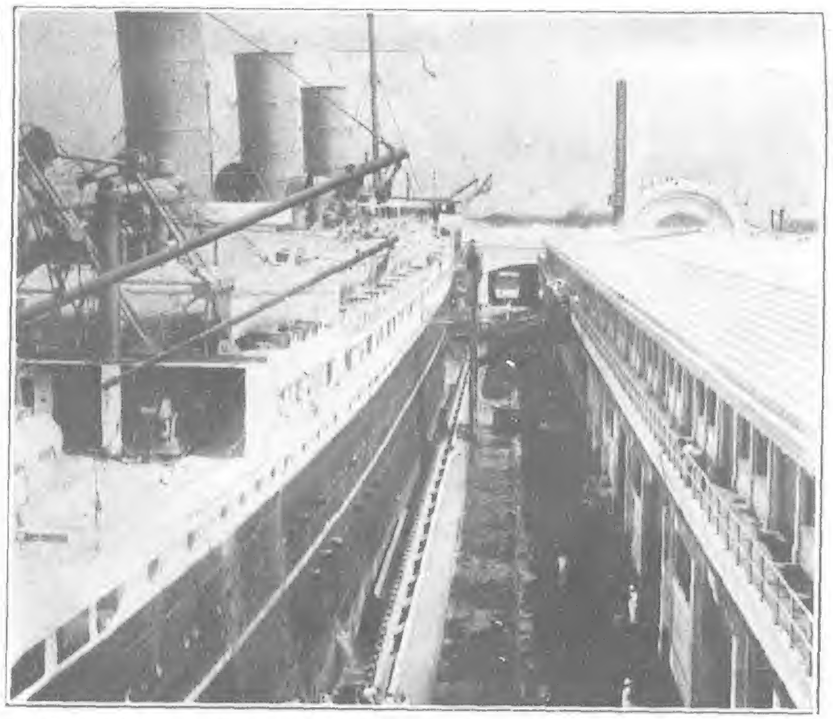
CONDITION GOVERNING DESIGN OF PIER.—As by far the great bulk of import cargo handled over Manila piers is destined for godowns or warehouses in various parts of the city not served by direct rail or water connection, such cargo must pass over the apron and into the pier shed, whence a large percentage is removed by industrial tractors and trailers to the adjacent cargo sheds or latterals for classification and delivery. In view of this and the fact eight per cent. of all export cargo is loaded aboard ship directly from barges alongside, it was deemed advisable to avoid depressed trackage and rails have accordingly been set flush with the apron block surface. Greater latitude was thus obtained for the disposition of each draft of cargo upon the apron whence it is rapidly removed by stevedores hand trucks or directly deposited upon industrial trailers or elevating platform trucks.



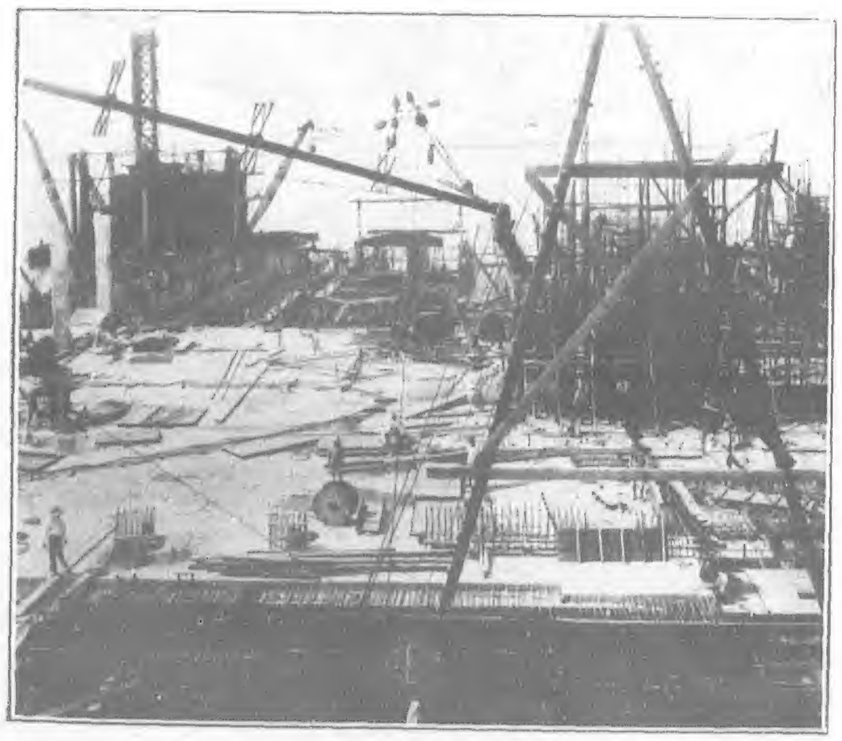
General View of Passenger Passageway—Pier No. 7

View of Underside of Floor System—Pier 7

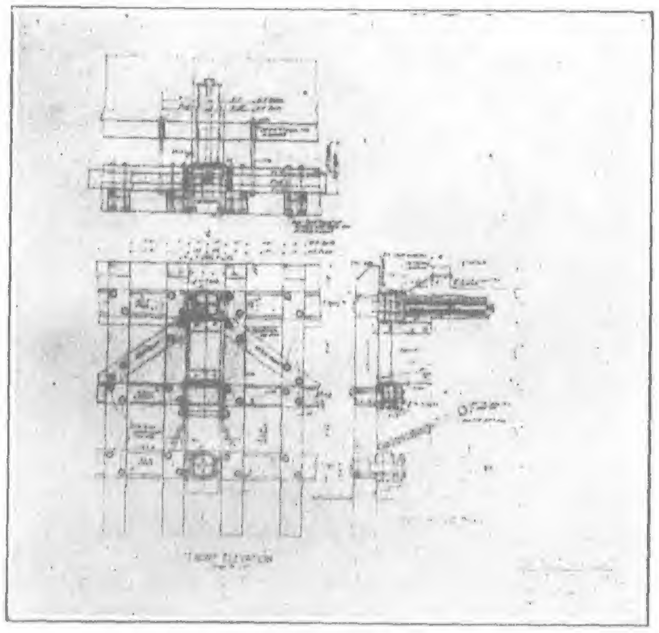
Pier 7, Manila, the most modern Docking Facility in the Far East.



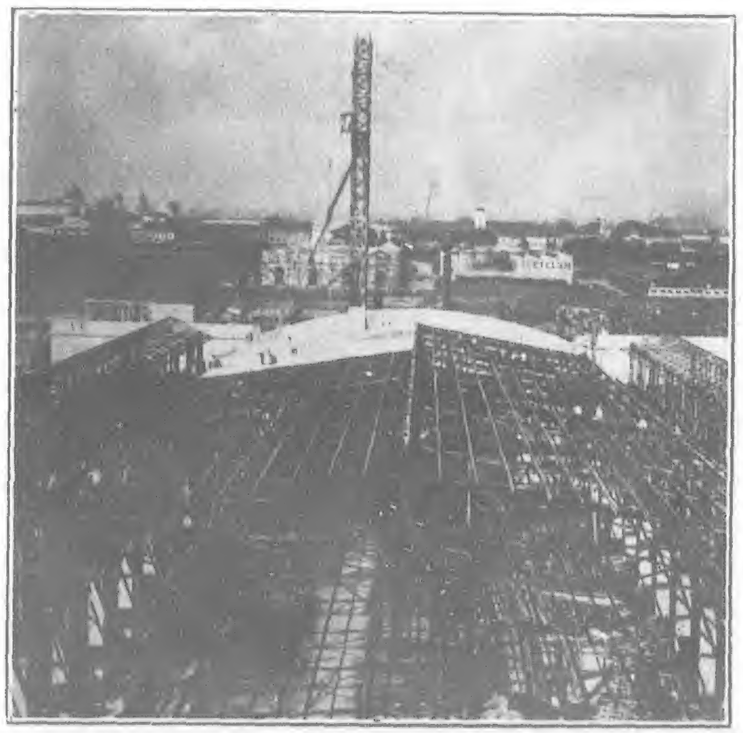
S.S. "Empress of Canada" at Pier 7. These View Shows Passenger Passageway, Travelling Landing Stage and Cradled Gang Plank



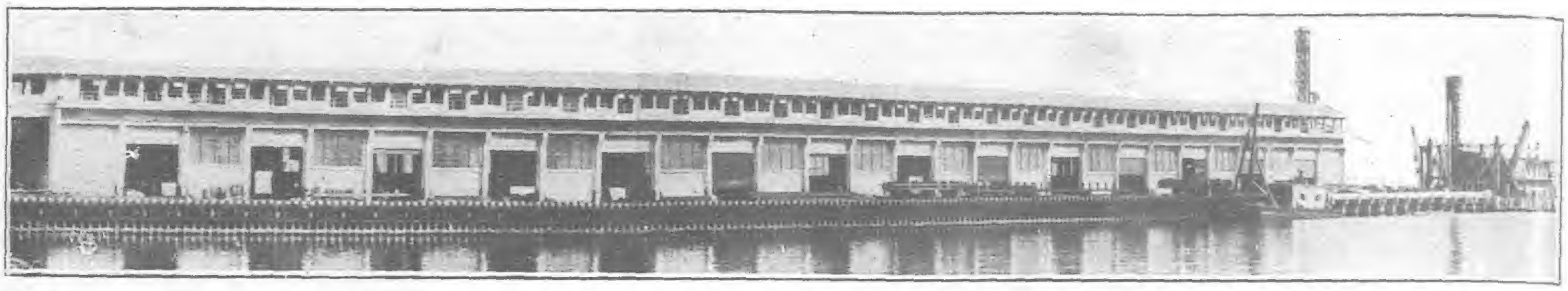
Construction View of Cargo Deck—Pier 7



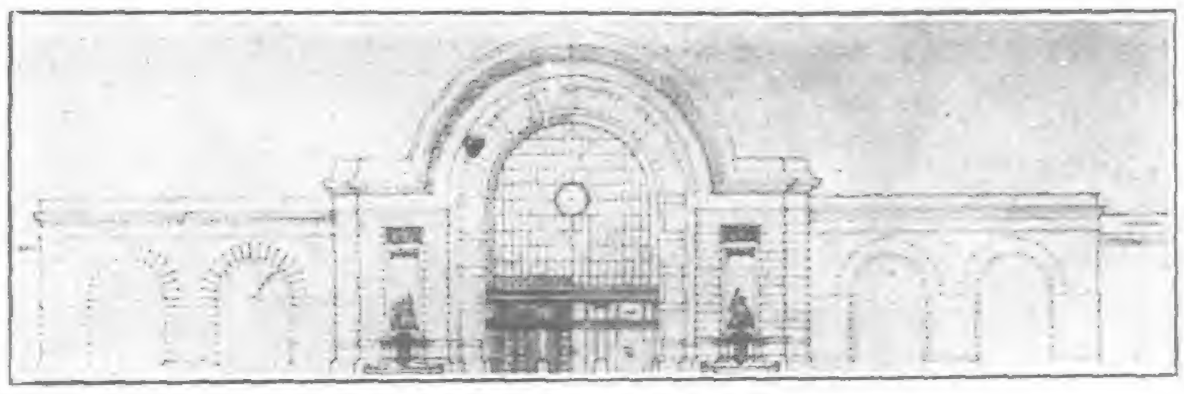
Typical Fender System Details—Pier 7



Construction View of Roof and Roof Trusses—Pier 7
(*Note*:—Suspenders Crane Runway)



Construction View of Pier 7 (This View Shows Fender System Partially Installed)



Front Elevation—Pier 7

The large quantities of hardware such as wire, spikes, galvanized roofing sheets, steel plate and other heavy materials like paint and print paper, arriving at the Port of Manila, led to the decision to design for rather heavy live loads to obtain maximum service from the structure. One thousand pounds per square foot was accordingly used in designing the floor system within the shed and 750 pounds per square foot for the aprons. Special provision was made in the design of the apron to care for the heavy reactions of the gantry cranes and freight locomotives.

Within the shed a special effort was made to avoid obstructing the cargo deck with numerous columns and to this end long span trusses (96-ft.) were designed to support suspended crane runway girders, thus doing away with a line of columns down the centre of the pier. Aside from the columns in the shed walls there are but two other lines of columns supporting the shed, all spaced on 22-ft. centres. This arrangement offers the maximum unobstructed floor space and at the same time permits of the very convenient division of the shed structure into four crane bays.

Design and Arrangement of Piled Substructure.—The design of the substructure was based upon the results of a thorough exploration and study of the underlying material of the harbor bottom, and upon results obtained by driving test piles at intervals over the area of the pier site. A two-inch Calyx-Core-Drill, motor driven, was used in making borings. The materials encountered varied considerably throughout the site. About 20-ft. of stiff blue mud overlaid the several other strata.

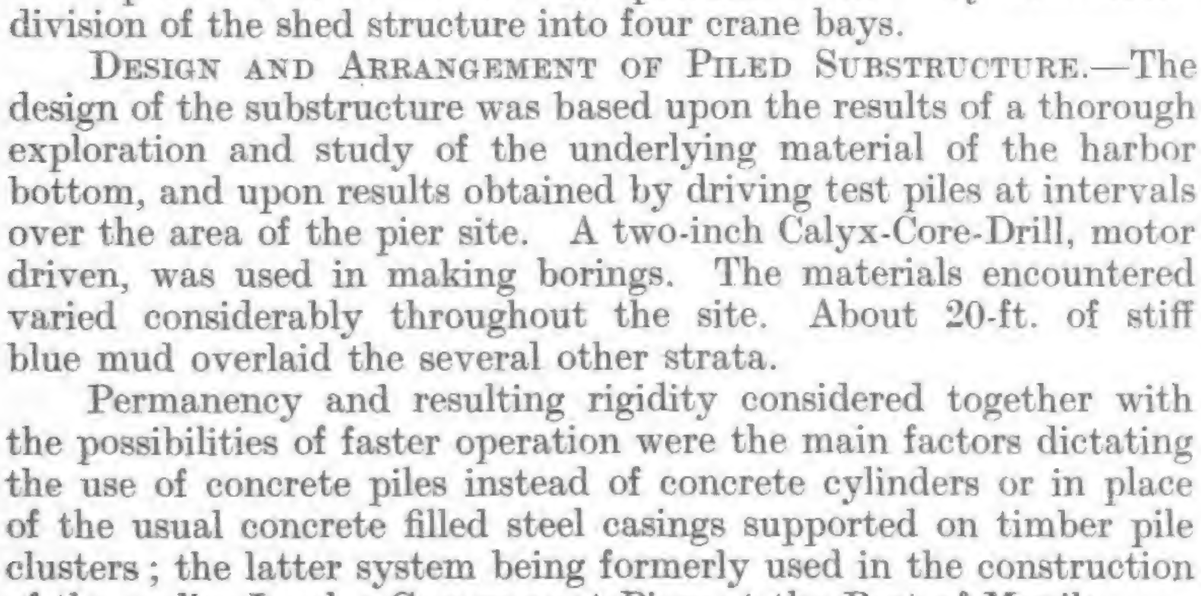
Permanency and resulting rigidity considered together with the possibilities of faster operation were the main factors dictating the use of concrete piles instead of concrete cylinders or in place of the usual concrete filled steel casings supported on timber pile clusters; the latter system being formerly used in the construction of the earlier Insular Government Piers at the Port of Manila.

Crane and locomotive reactions on the aprons, door and column spacings and the live loads noted above indicated the general arrangement of the piles and the loads to be sustained by each.

Transverse pile bents and fender brackets are spaced on 11-ft. centres throughout the main structure, while the longitudinal lines of piles are spaced on 16-ft. centres under the shed and on 13 and 18-ft. centres under the aprons. The outermost row of piles in each transverse bent are driven in pairs as they must sustain very heavy loads from the front legs of the gantry cranes. Under each shed and wall column a pair of vertical piles and one batter pile have been driven. This arrangement requires 25 piles in each transverse bent under the columns and 17 piles in all other bents. The load sustained by an individual pile varies from 90 to 108 tons. These loads necessitated the use of piles having a cross section 24-in. square.

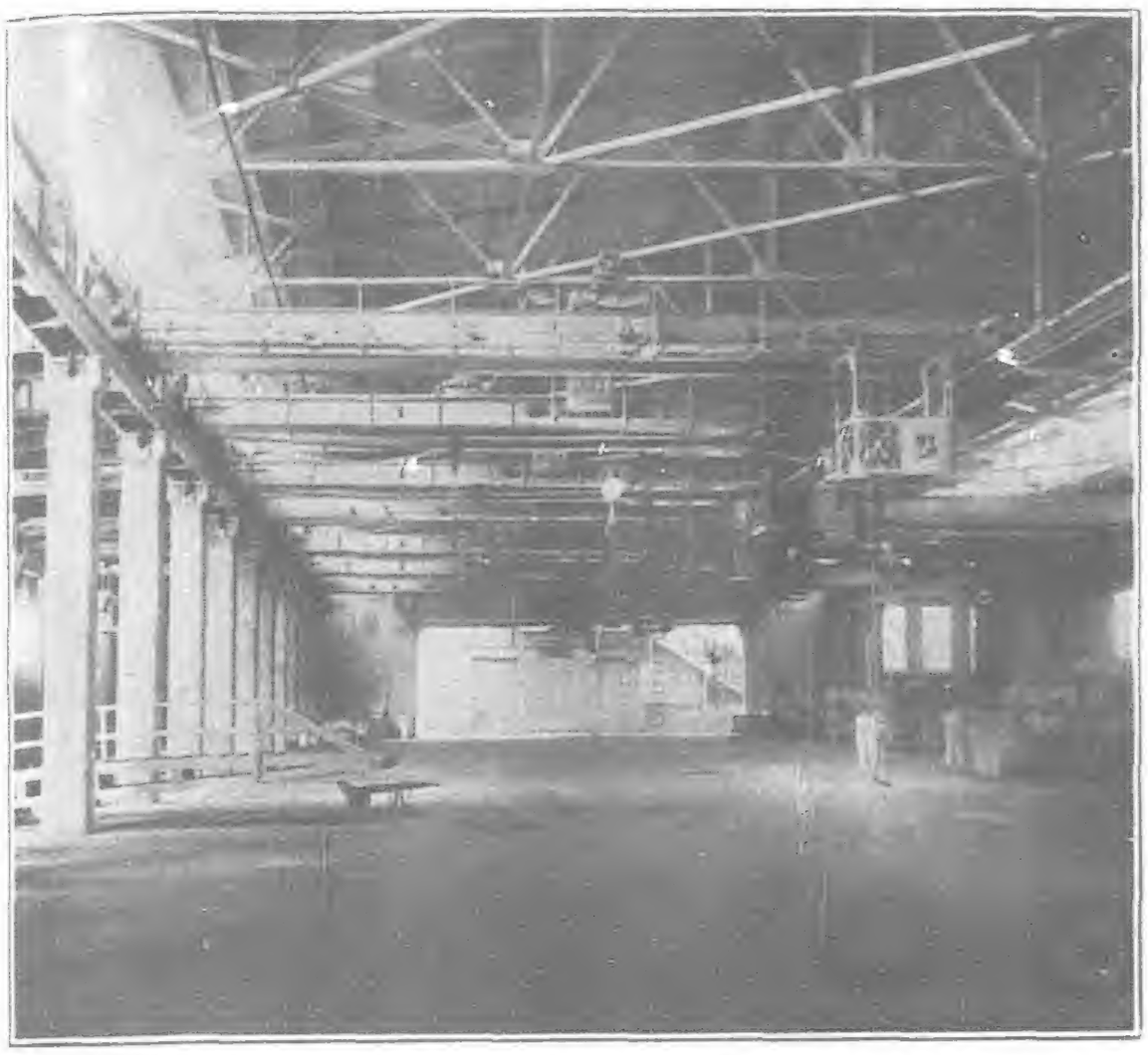
Piles of a considerable variation in length were required; the longest or 110-ft. piles being driven on the inshore end of the pier and as far out as 400-ft. From this point on to a distance of 800-ft. from shore 90 and 100-ft. piles were driven to grade. The longer piles (110-ft.) were used for the remaining length of the structure, but at a distance of approximately 300-ft. from the offshore end they were driven from 10 to 30-ft. below grade with a follower. Pre-cast pile sections, belled out at the bottom, were set over these piles and grouted in place under air pressure. The very peculiar condition of the harbor bottom at the extreme offshore end of the pier necessitated a greater penetration of piling than was required over any other portion of the site. This was due to the fact that the several thicker strata of harder materials covering most of the area and which offered fairly good frictional resistance, pinched out at the end to relatively thin layers offering fair lateral support but insufficient frictional resistance. Accordingly the pilling had to be driven further and into harder materials existing at greater depths.

General Layout of Construction Plant.—A provisional wharf and convenient land plant was constructed adjacent to the pier site, for casting piles and for building the floating equip-



Port of Manila

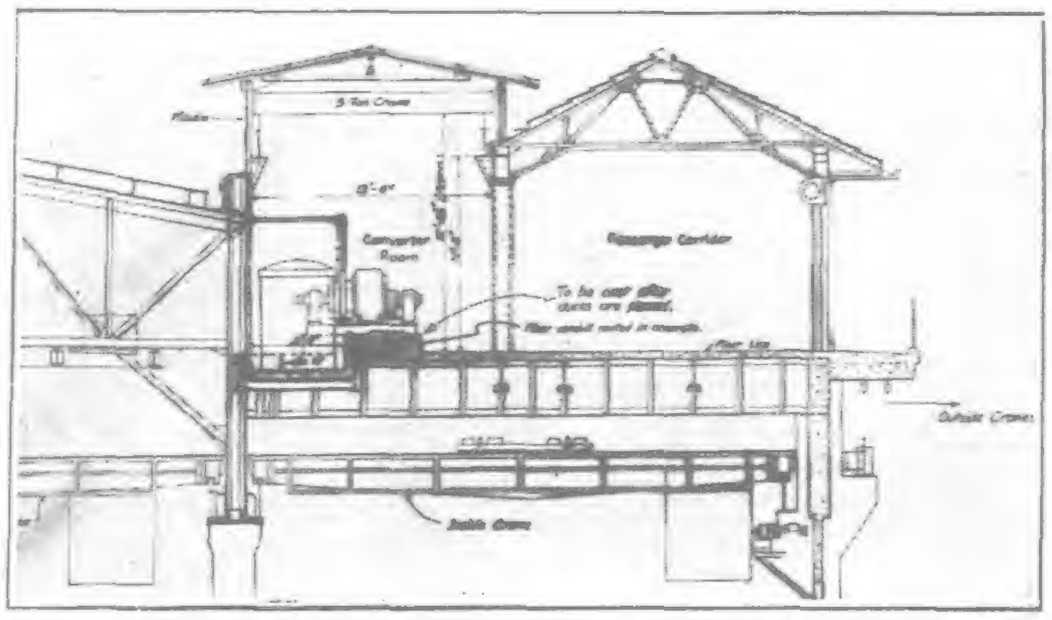
Semi-portal—Revolving Gantry Gib Cranes—Pier 7, Manila



Interior Electric Overhead, Cranes—Pier 7, Manila (*Note:*—Suspended Crane Runways in Centre)

View of Pile Field and Ladder Track System—Pier 7, Manila (*Note:*—Field Filled with Piles Seasoning)

ment consisting of a mammoth pile driver, 8,150 ton material barges, a 500 ton pile barge, 2-test barges and other pieces of floating equipment such as derricks. The general layout of the pile field, storage yards, sheds, shop, provisional wharf and launching ways is shown in the figure at the bottom of this page. A 16 ton derrick was erected on the south end of the wharf and two elevated material bins of 200 yards capacity were put up adjacent to the wharf and within reach of the derrick boom. Sand and crushed rock was handled from scows to the bins by 1½ yard grab bucket and this aggregate was moved in dump cars to large storage piles situated to the rear of the HEAD TOWER of the cableway pile-casting plant by means of an elevated track which passed under the two bins.



Sub-station Arrangement

The pile field was so laid out as to permit of casting the piles with an aerial cableway and for moving them from the field to the pile barge with a locomotive crane operating over a ladder track. The entire field accommodates 1,584 piles of various lengths.

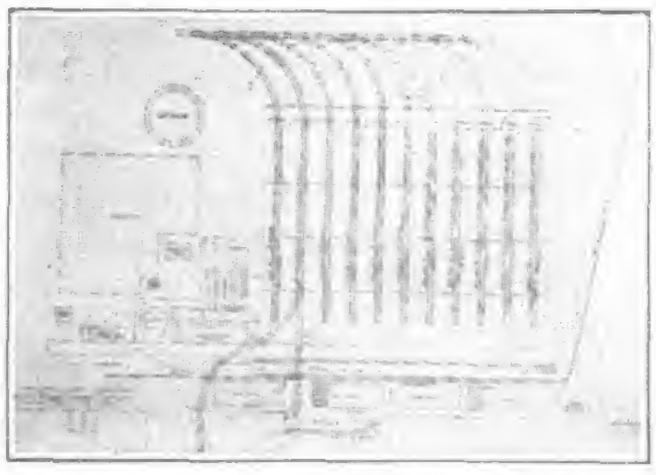
AERIAL CABLEWAY PILE CASTING PLANT USED.—Various methods of casting the piles were studied with a view to assuring the deposit of well mixed batches of dense concrete in the pile forms. The cableway type of plant best suited local conditions and was built. A pair of standard gauge tracks were put down at each end of the pile field approximately 550-ft. apart. Over each pair of tracks a timber tower was mounted on six standard railway trucks. Both towers were weighted with heavy concrete blocks forming the anchorage for the track cable. A 1½-in. track cable was suspended between the two towers and carried a steel carriage (hauled by an endless cable) from which a bottom dumping bucket for concreting was suspended. Mixers were centrally mounted on the HEAD TOWER platform. This tower also carried the hoisting and haulage machinery consisting of a h.p. double drum contractors hoisting engine and swinging gear; the latter rigged to drive the haulage line. One drum was used for hoisting the filled buckets to the latching carriage hock and the second drum for hoisting the aggregate to the hopper, while the shaft of the swinging gear was fitted with a large improvised driving pulley which drove the endless haulage line. The TAIL TOWER carried a two ton floating counter-weight to maintain the proper tension in the endless haulage cable.

The 1:½:3 mixture used in the plies was well graded, thoroughly mixed and unusually well placed. Tests showed the concrete to be dense and strong, cubes breaking at average values of 3,600 to 5,300 pounds per square inch after seasoning 28 to 40 days.

Approximately 230 yards of concrete were handled daily with the plant when operating to capacity, 14 piles being cast.

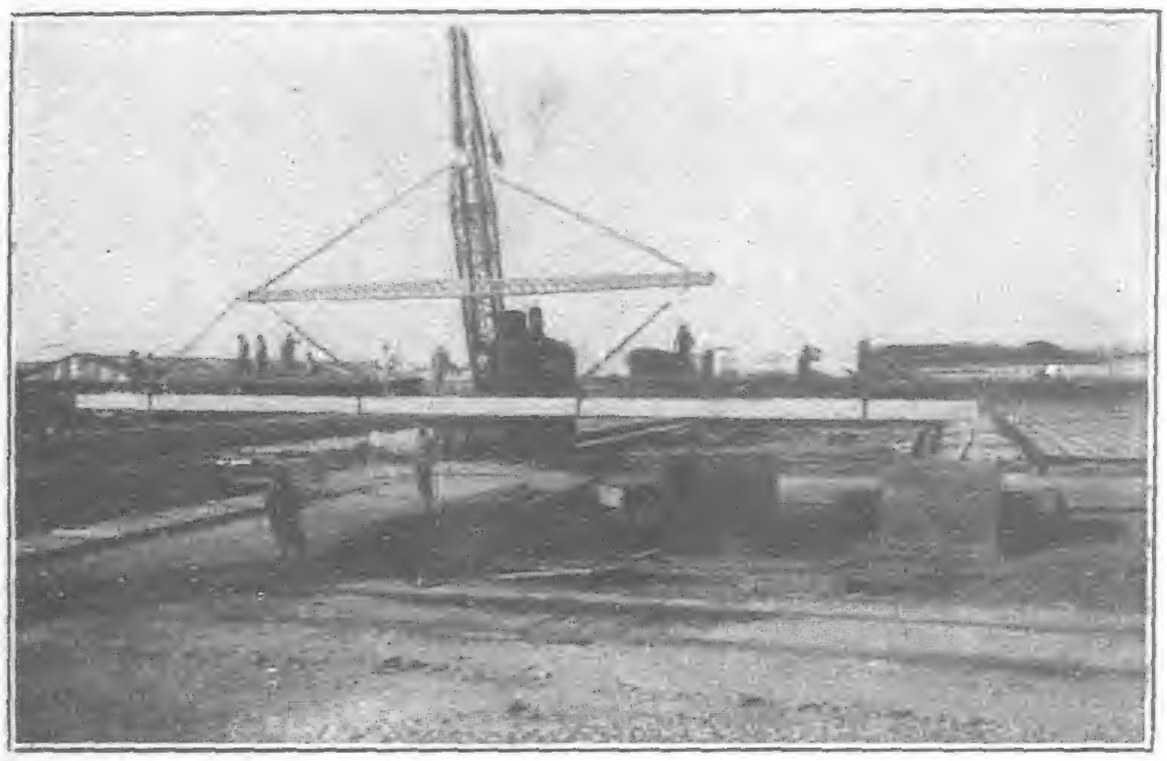
The use of this type of plant instead of a spouting plant made it possible to deposit the aggregate in almost the same state it left the mixer, at the same time leaving the area occupied by the pile forms entirely clear of platforms and other obstructions.

REINFORCED CONCRETE PILE MAKE-UP.—The piles are reinforced with eight one inch corrugated bars with centre of steel 2½-in. from the surface. Hoops of ¼-in. rods were used with a spacing of 1½-in. at head of pile for a distance of 3-ft. then 3, 6 and 9-in. centreings over a distance of one, two and three feet. Twelve inch spacing was satisfactory for the rest of the length of the pile except near the point of the pile where the hoops were spaced on 3-in. centres for a distance of 3-ft. All bars were allowed to project three feet above the head of the pile for the purpose of rigidly connecting the deck girders to pile, while at the points the bars were bent inward to better reinforce that part. A 1½-in. rod bent in the shape of a hairpin, was set in the head of each pile to receive the shackle of the pile line used in suspending the pile in the leads of the driver. Cambered piles were cast for use as batter or brace piles and were reinforced as noted for the straight piles except considerably heavier in the plane of camber. The camber in the longest batter pile amounted to approximately 5½-in.

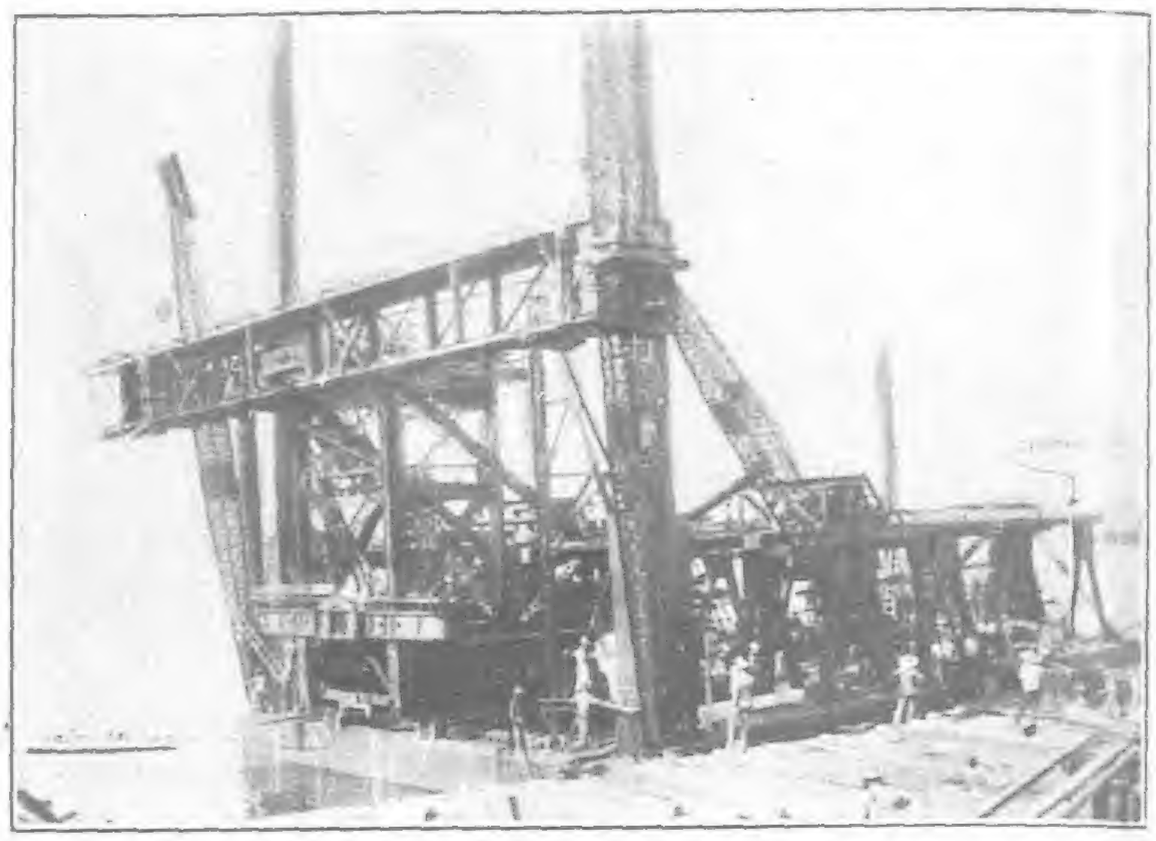


General Layout of Plant and Pile Field.—Pier 7, Manila

FABRICATION OF PILE REINFORCEMENT UNITS.—The reinforcement units for the piles were fabricated under cover in the make-up shed in sets of three. When a set of three units were completed, bridge timbers are swung down; racks pushed back and the units moved out on to the storage supports whence the locomotive crane removed them to the field for storage



50-Ton Locomotive Crane Carries 110-foot Pile from Field to Barge—Pier 7



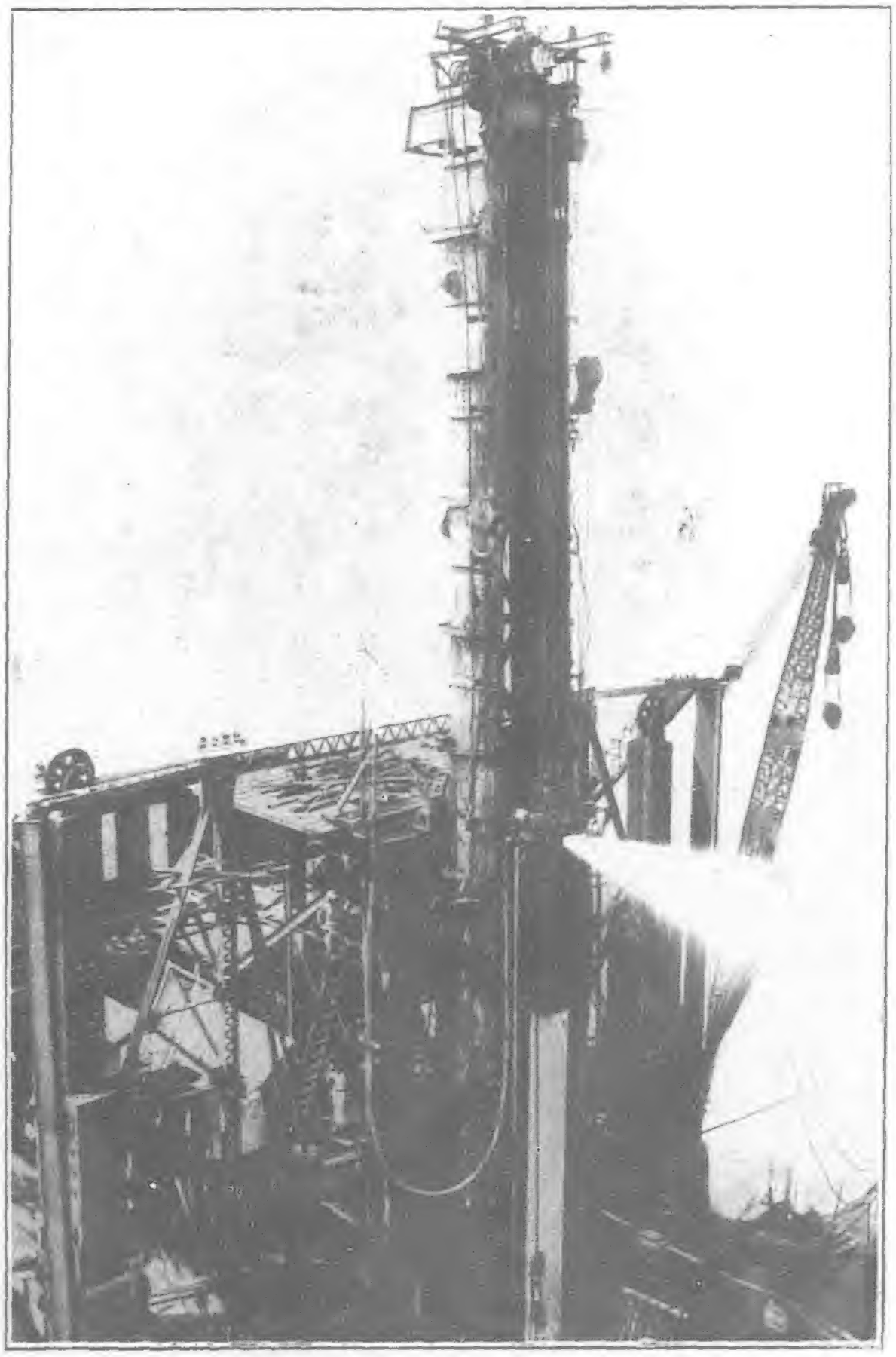
Pile-driver Mammoth under Constructions

until needed or set them into pile forms. Nine units were fabricated daily, working a nine hour shift.

HANDLING PILES FROM FIELD TO PILE BARGE.—Piles seasoned 60 days or longer are removed from the field to the pile barge, when needed, by a 50 ton locomotive crane mounted on speeied 10-ft. gauge trucks. The lifting rig which is suspended from the crane boom was designed especially to avoid inducing severe stresses in the piles. Essentially the rig consists of a long upper spreading strut of latticed structural steel, spreading two flat woven wire cables which hang from the crane hook. A pair of equilizing sheave located near each end of this strut carry a pair of cables which support the two shorter latticed struts below. To each of the two lower struts are attached a pair of hinged steel pendants and a bottom bar. When piles are to be removed the rig is lowered over the pile and the arms of the pendants are raised on the near or open side of the pile while the bottom bars are inserted through tin covered slots left in the forms for this purpose.

MAMMOTH PILE DRIVER CONSTRUCTED.—The successful handling and driving of these extra large piles, which are of record size—110-ft. long by 24-in. square—and which weigh 64,000 pounds, required the construction of what is perhaps the largest and most powerful floating pile driver ever built, of a type especially adapted to the needs of the project, equipped with long steel movable leads a powerful steam hammer, a pair of 40 ton steel derrick with 60-ft. booms; powerful hoisting engines; a battery of both steam and electric high pressure jet pumps, and much other machinery required for the efficient functioning of the driver.

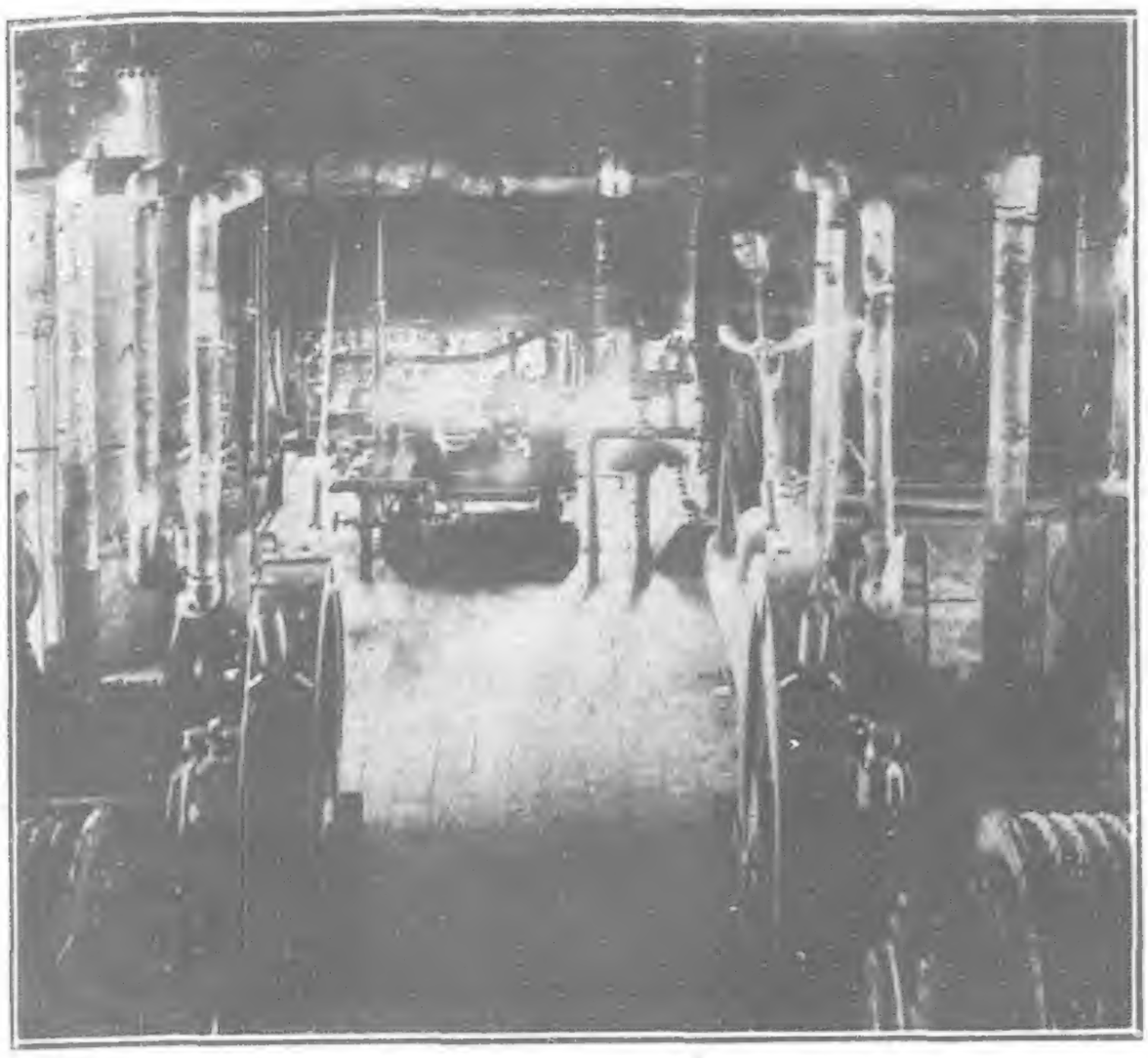
HULL.—To obtain ample stability under all conditions of operation and to provide sufficient space for the installation of all machinery, a staunch wooden hull 110-ft. long, 55-ft. wide with a depth forward of 15-ft. 6-in. and 7-ft. 6-in. by the stern, was designed to float with a free-board of about 5-ft. with deck level, displacement approximately 1,200 tons. Due to the necessity for concentrating the bulk of the machinery at the bow end of the hull, the bottom was sloped downward from the stern to the bow to secure the needed additional bouyancy there. The make-up of the hull consists of a series of cross frames and transverse and longitudinal bulkheads of heavy Oregon pine timbers, forming twelve watertight compart ments, each equipped with a 4-in. bilge syphon. The sides and bottom are planked with 6-in. lumber. Two heavy stiffening trusses were framed into the hull to prevent hogging. Especially heavy bulkhead construction was necessary neat the centre of the bow and immediately under the steel carriage.



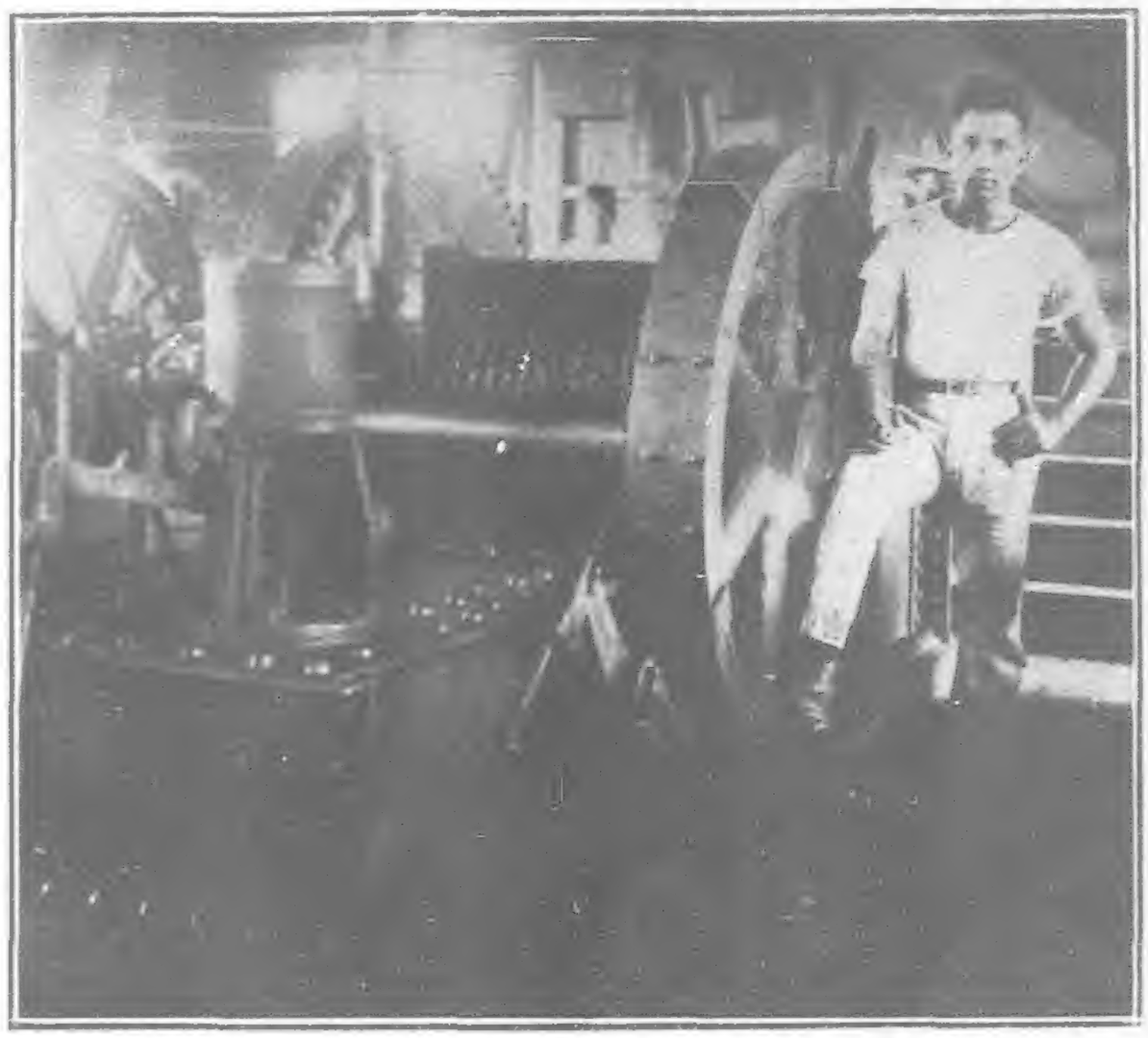
Mammoth Pile-driver

GENERAL ARRANGEMENT OF DRIVER.—The main machinery is carried on the several levels of the leader carriage which is centrally located at the extreme forward end of the driver. All other machinery and plant is fixed to or founded on the main deck with the exception of the Port and Starboard derrick engines carried on the upper deck and the captan engines below deck. The boiler room, situated on the after part of the main deck, houses the power plant and the forward spud engines. Boiler feed-water tanks of ample capacity were built into the hull below deck. An 8 by 8-in. double cylinder compound geared anchor windlass with two gypsis is fixed to the deck at the stern end of the driver aft of the boiler room, and carries two 5,000 pound anchors.

Open deck space running fore and aft on both sides of boiler room is utilized for deck fittings such as line spools, mooring bitts, steam and dummy capstans for the handling of lines when man-



Boiler Room, Pile-driver "Mammoth"



Forward Spud Engines, Pile-driver "Mammoth"

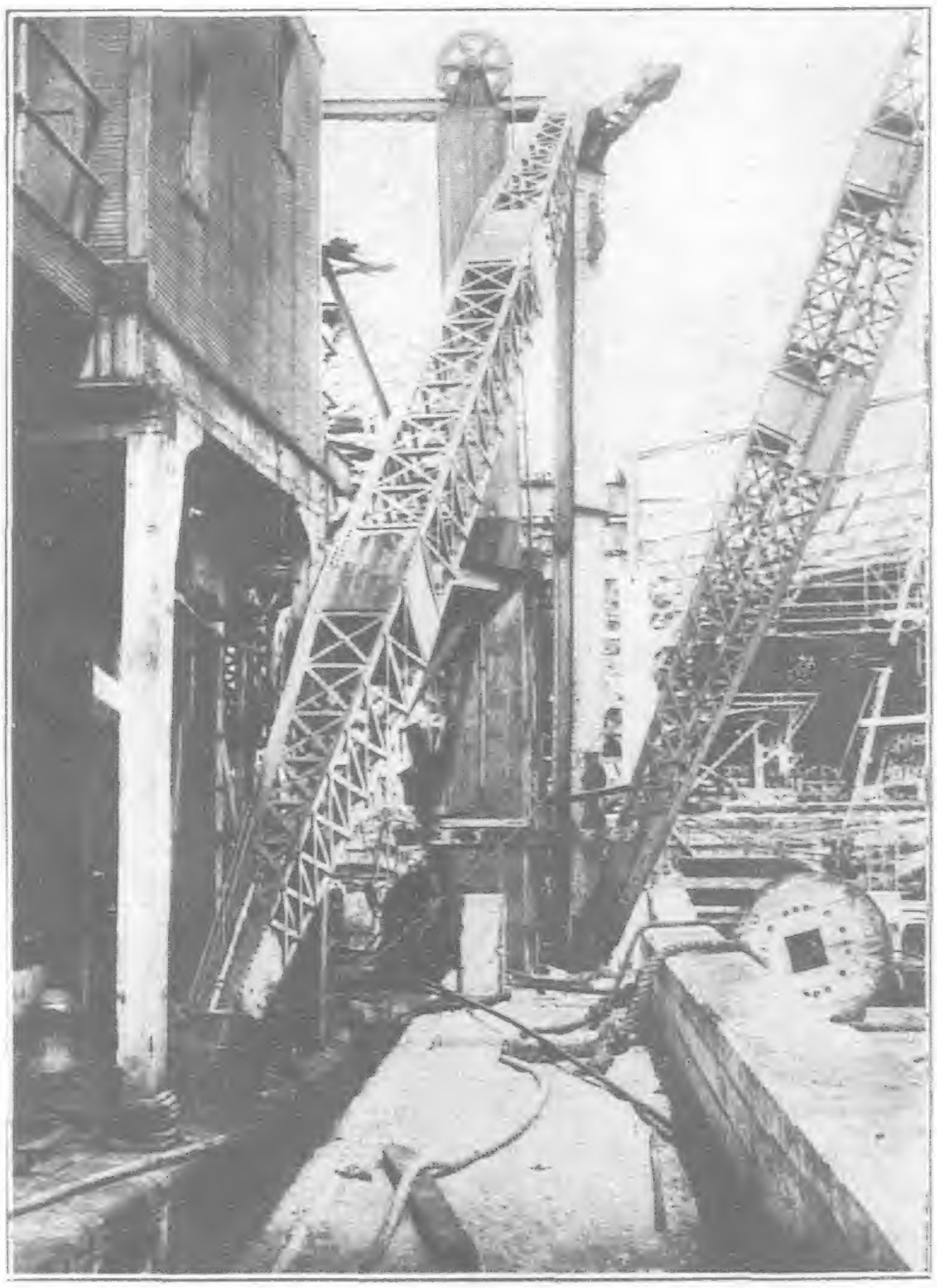
cuvering. Two steel derricks of 40 tons capacity are bracketed to the forward corners of the driver. Living quarters for the Driver Superintendent and engineman are provided on the aft part of the upper deck. The crew are provided with folding bunks and lockers in the boiler room.

Ponderous Spuds.—For the purpose of adequately anchoring the hull in position when driving and to further stabilize the driver during all operations, by pinning up, the hull was equipped forward with two ponderous spuds, each 36 inches square and 96-ft. in length, weighing approximately 20 tons each, while aft a single spud 24-in. square and of the same length was provided to hold the driver against swinging. The forward spuds were made up from 20 by 20-in. timbers, securely fastened with clinch bolts. All spuds were equipped with cast steel shoes, slightly tappered; those for the forward spuds weighing approximately 6,000 pounds each. The top of each forward spud carried a 42-in. cast steel sheaved and a similar sheave, housed, was fitted in each spud just above the shoe.

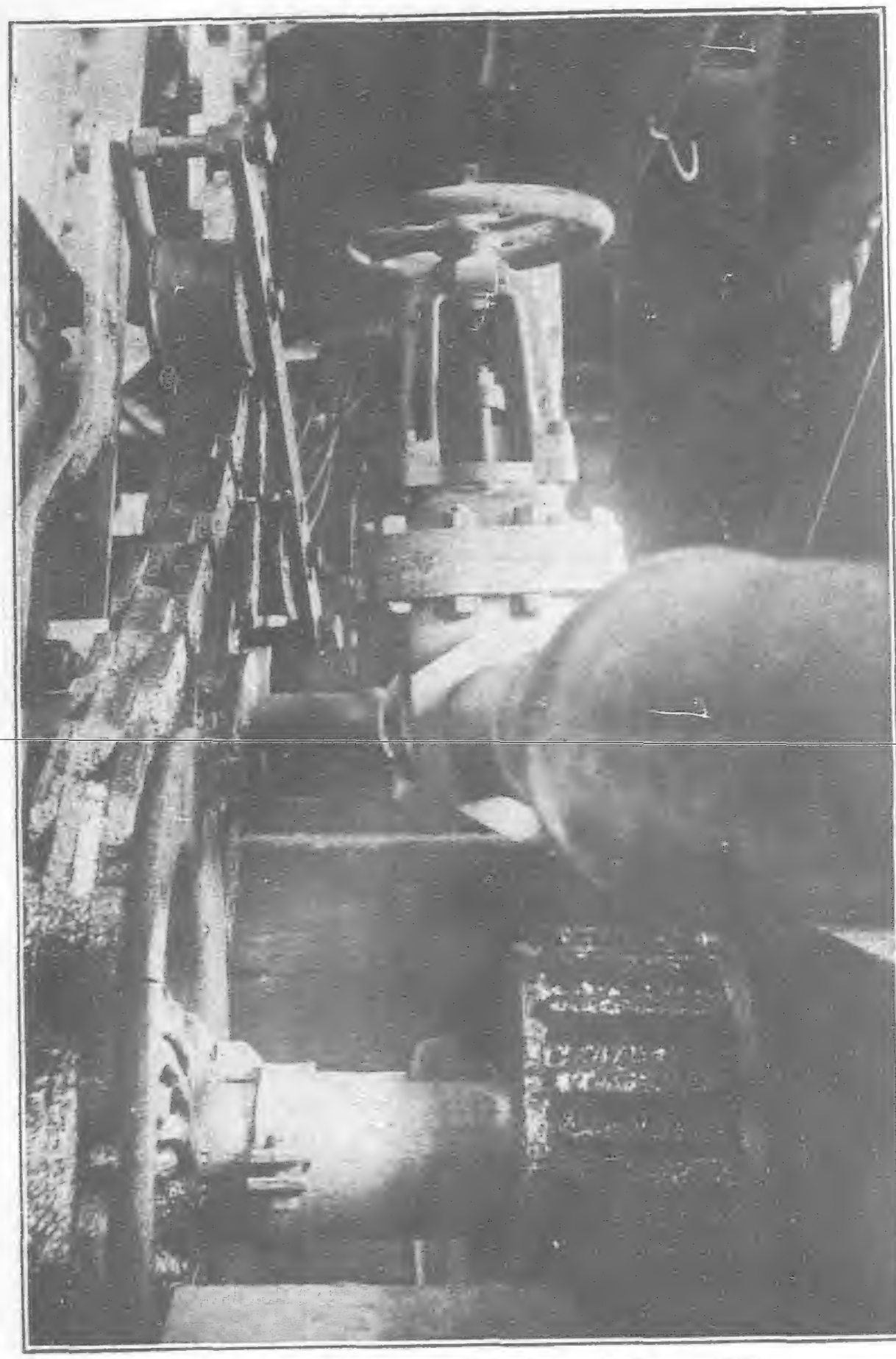
Heavy timbers bolted to the sides of the hull form the spud wells and guides. An upper spud keeper and a lower spud gate of cast steel are fastened across the outer face of each pair of spud guides.

Operation and Rigging of Spuds.—The raising of lowering of either of the forward spuds is accomplished at the will of the Leverman on the operating bridge, through lever controls governing seperate $8\frac{1}{2}$ by 8-in. double cylinder reversable spud engines. The spud cables used are $1\frac{3}{4}$-in. diameter plough steel, 6 by 37 construction, with steel centres. One end of both upper and lower spud cable

View of Starboard Girder of "Leader Carriage"—Pile-driver "Mammoth"
(*Note*:—Rollers under Girder)



40-Ton Steel Derricks on Pile-driver "Mammoth"



Propelling Mechanism, Pile-driver "Mammoth"

is clipped to the spud engine drum. The cable leading from the underside is carried forward through the hull, below deck, and up through the deck at the spud, over an idler sheave and down under the lower sheave housed in the spud, then up to the second set of adjusting bolts. A "pin up" of the forward end of the driver of about 16-in. is possible with this equipment.

As the stern spud is used only to prevent swinging, it is not equipped with a top sheave. The rigging for raising this spud is similar to that for the forward spuds but lighter, however no seperate spud engine is used ; the 1¼-in. cable attached to this spud being carried forward through the hull below deck whence it is trained to a drum driven by the main engine, situated on the second level of the leader carriage.

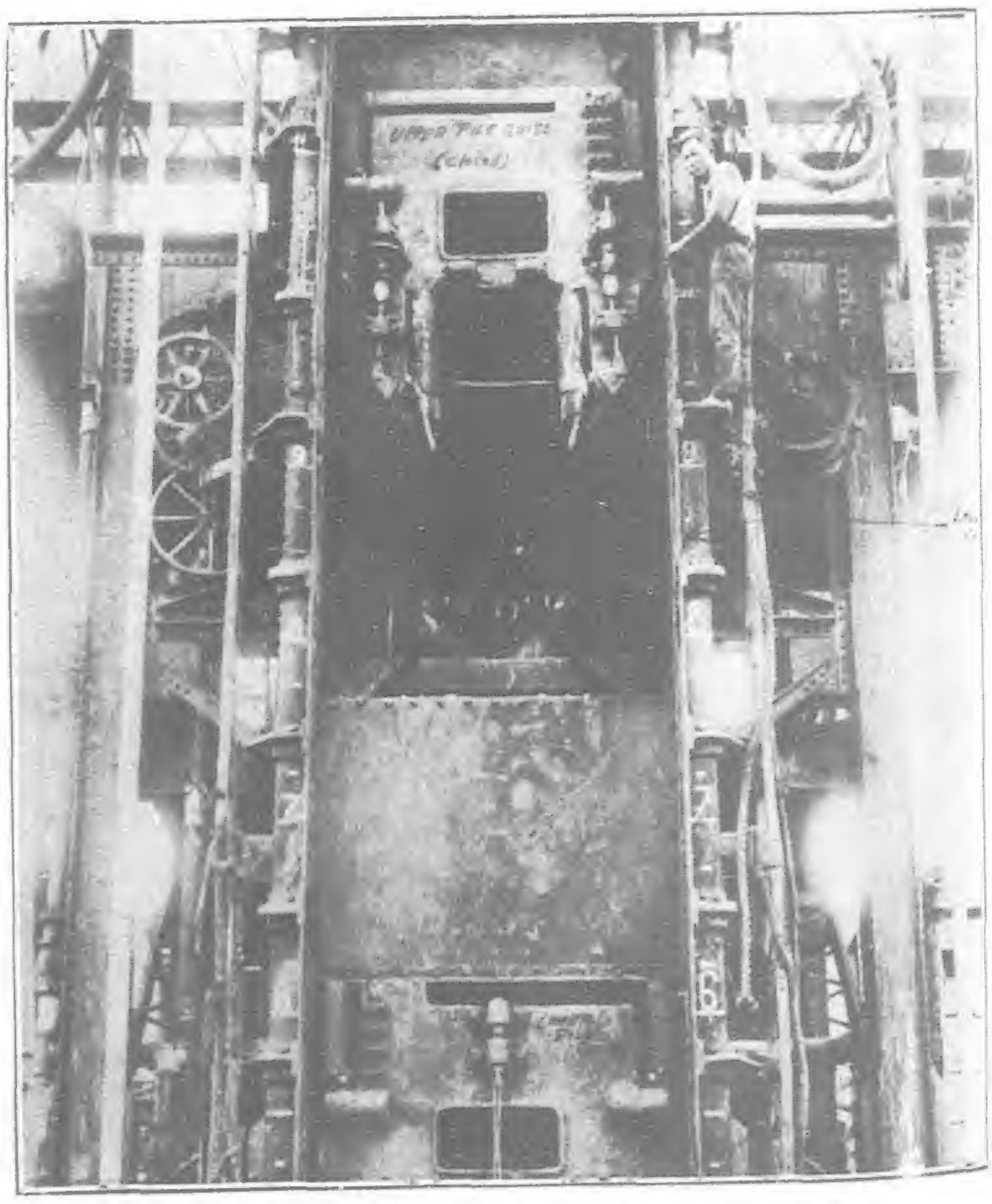
LEADER CARRIAGE.—A heavy carriage of structural steel, upon which is mounted the main machinery including the carriage propelling mechanism also carries the steel leads, the tipping (screw) engine and a battery of steam and electric driven jet pumps. It is designed to move fore-and-aft on rollers through a distance of 7-ft. 6-in. Essentially it is made up of a pair of steel box girders, stiffened and braced with cross frames ; a pair of longitudinal trussed frames riveted to the after ends of the girders and a four post steel superstructure supported on the girders. The forward portion of the carriage rests on two nests of 6 eight inch steel rollers, which in turn bear on and move in a pair of steel track channels bolted to bolster timbers over the centre bulkheads of the hull. The after portion rests and slides on two plained slide bearings.

All steam jet pumps and part of the electric jet pumps are mounted on the lower level of the carriage about 2-ft. 6-in. above deck, while the main engine and drums are carried at the rear of carriage on heavy cross beams at the second level approximately 11-ft. 5-in. above deck. The tipping engine is also on this level, but forward. The operating platform occupies the third level, 27-ft. above deck, and it is here that all lever and other principle controls are centreed. The fourth level, 34-ft. above deck carries two pairs of cross beams at the rear which house the pile and hammer line guard sheaves is roofed to afford protection to the Leverman on the operating platform below.

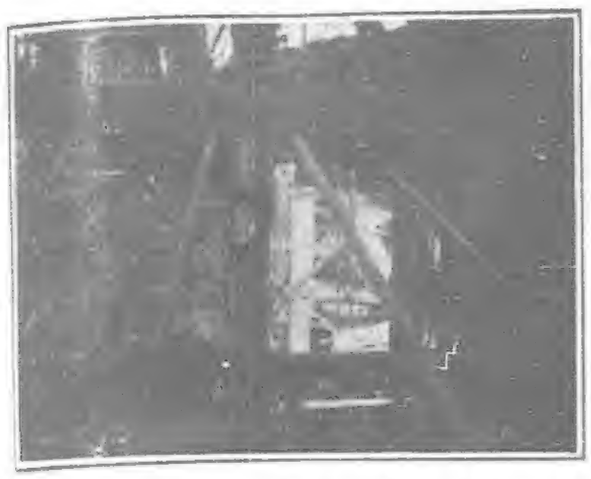
A heavy transverse girder rests on and is secured to the forward end of the carriage about 11-ft. 6-in. above deck and carries the lower pintle which receives no weight from the leads ; its function being to transmit motion in a transverse direction to the leads and to permit swiveling of same. A second transverse girder is secured to the front columns of the upper carriage frame, 34-ft. above deck, directly over the lower girder and carries the upper pintle bearing which in turn supports the entire weight of the leads, hammer and pile. Propulsion of the carriage is effected by means of a rack and pinion driven by the main engine ; the rack being securely fastened to the deck.

LEADS.—The steel leads, especially designed to move transversely across the face of the leader carriage or to swivel about the upper pintle bearing for driving batter piles, are 93-ft. 6-in. long from top of pile sheave to water line and of "U" form in cross-section, measuring 6-ft. 3-in. across the open face and 4-ft. 9-in. in depth. Structurally, the leads consist of a number of heavy cast steel yokes spaced 6 to 8-ft. apart, plated up on both sides, open in front, stiffened with angles in each corner and heavy diagonal bracing in the back, except at both extremities where solid back plating was used and at the upper pintle where a heavy plate diaphram extends the full distance between yokes. The top of the leads is capped with beams and plates arranged to support the large pile line and hammer line sheaves on bracketed bearings. A track for guiding the steam hammer, made up of "Z" bars, extends the full length of the leads on both sides. Near the top of the leads the track slopes away towards the rear and permits the hammer to completely enter the leads ; thus presenting a clean and unobstructed face to piles turned up across the frame. An automatic hammer locking device locks the hammer after it has entered the leads.

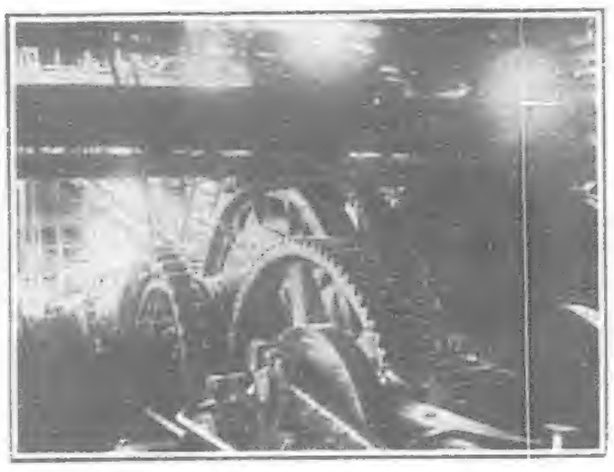
Suspended within the leads is the movable upper pile guide which can be held at any desired elevation. During the process of turning a pile up and into the leads, both upper and lower pile guides remain in a collapsed or turned down position. After



Partial View of Leads, Pile-driver "Mammoth"



Upper Screw-shaft—Pile-driver "Mammoth"



Main Machinery, Pile-driver "Mammoth"

the pile has been suspended in the leads, both guides are turned out to give support to the pile and the fingers of the upper guide are then laid over to prevent the pile from falling outward. The lower guide, which is stationary, is hung within the leads at a fixed elevation.

Leader Tipping Engine.—Movement of the leads is accomplished by lever controls governing the single 8½ by 8-in. double cylinder reversible tipping engine, located on the second level of the leader carriage, which drives both the upper screw shaft operating on the upper pintle bearing and the lower shaft connected with the lower pintle. The simultaneous operation of both upper and lower screw shaft produces a transverse movement of the leads while the operation of either upper or lower screw shaft, independently, swivels the leads about the upper pintle. The leads may be moved while in a vertical position from one side of the carriage to the other through a distance of 9-ft. or may be brought to a 1-3 batter and then moved in either direction through the same space.

Main Machinery.—The main machinery consisting of the pile hoist, hammer hoist, stern spud hoist and pile guide drum is located on the second level of the leader carriage and is driven by a single 12 by 16-in. double cylinder reversible engine.

Operating Platform.—All principle motions of the driver are controlled from the operating platform. From this platform the Leverman commands a good view of the work and is in an excellent position at all times to see the signals made by the superintendent on the pier deck. Twenty five lines of control originate here; the most important ones being centreed in or near the lever stand facing the leads.

Power Plant.—With the exception of the battery of 6 electric jet pumps, all machinery is operated with steam furnished from a 76-in. by 18-ft. locomotive type boiler—A.S.M.E. standard—under a pressure of 150 pounds.

A small verticle standby high pressure boiler has been installed for use in case of an emergency, to raise or lower spuds and to operate the anchor windlass. Power for the operation of the electrically driven jet pumps on the driver is brought from shore at 3,300 volts and stepped down to 250 volts for operation.

Large Special Steam Hammer Used.—The big hammer used to drive the piles was especially constructed for this project, and has several features of importance, principal of which is the safety device for preventing the ram from operating unless the hammer has been fully seated upon the pile to be driven. The hammer including follower casing, stands 17-ft. in height, measures 36-in. across its face and 26-in. in depth, and weighs with follower approximately 32,000 pounds. The main body is cast iron and contains the cylinder, valve chest and ram guides. The cylinder is of 14-in. bore; 36-in. stroke and operates a 4,000 pound ram. The piston is double acting and with an effective steam pressure of 80 pounds the hammer develops approximately 4,000,000 foot pounds of work per minute—striking at the rate of 85 blows.

The follower is of cast steel and is designed to fit over the hair pin and the reinforcing rods which project above the head of the pile. A spike wood cushion block of native hardwood known as mountain Dungon, which is very tough and fibrous and which is banded with ½-in. flat steel 4-in. wide and 18-ft. long wrapped 3 times around and riveted with countersunk rivets closely spaced fits on top of the follower and receives the direct blows of the hammer. Cushion blocks last on the average for the driving of 6 piles. Where the driving has been very hard some blocks have given out after driving a single pile.

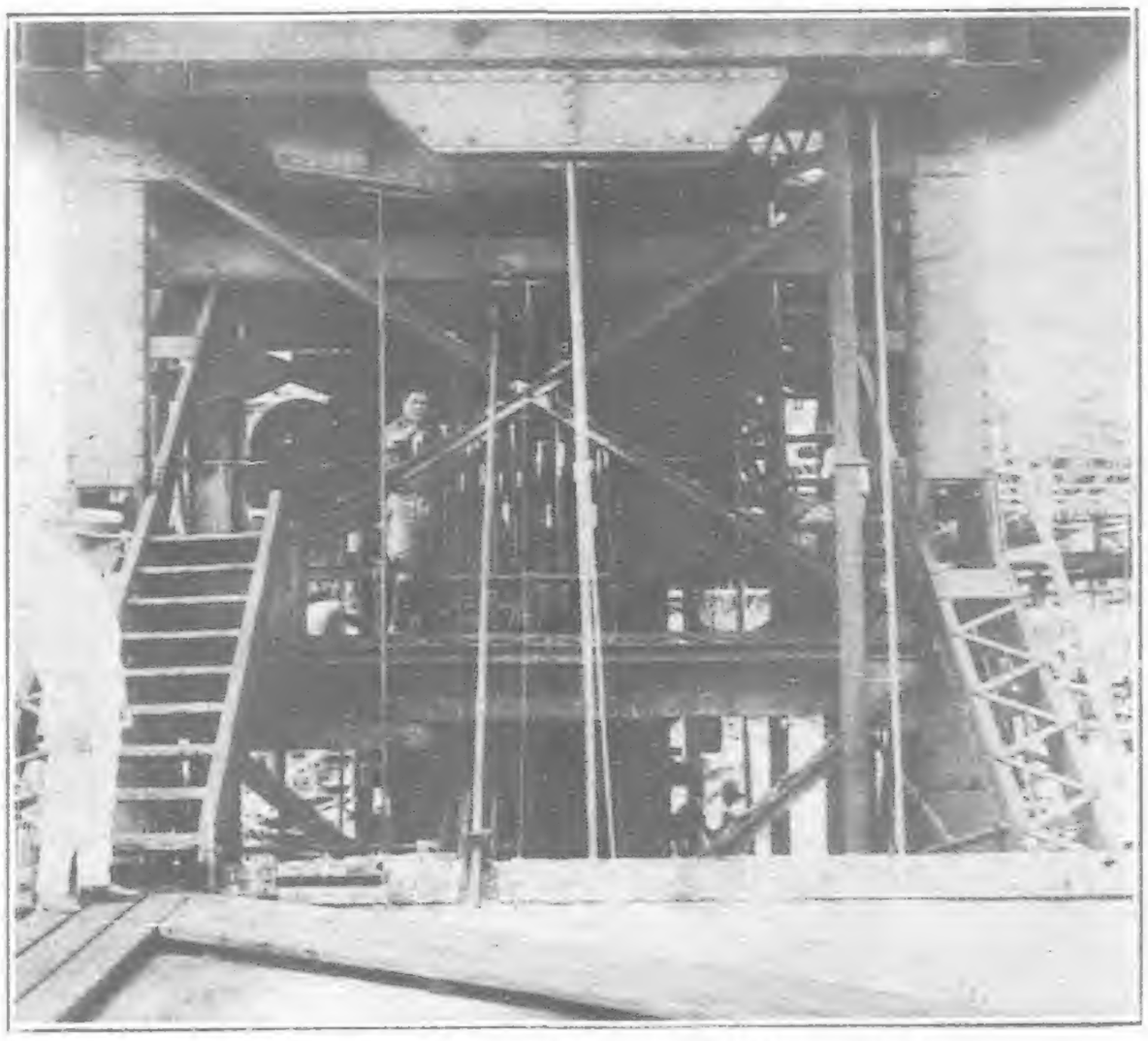
A pair of roller guide brackets are attached to the upper part of the hammer body and to the follower casing, and travel in the hammer track of the leads, thus permitting the accurate location of the hammer over the pile.

High Pressure Jets.—A battery of two single stage 50 pound, two-2 stage 100 pound, and two-4 stage 200 pound centrifugal pumps, electrically driven, are split into two banks of three pumps each connected in series, and supply water at the rate of 500 gallons per minute under a pressure of 350 pounds to both of the three jet lines. Each pump is by-passed to enable the use of any two in case of a shut down of a third. The three sizes of pumps were installed with a view to furnishing a maximum pressure when jetting operations are most difficult and to provide for a saving of power by cutting out one or two pumps on each jet line while operating over that portion of the pier site where less difficult jetting was to be found.

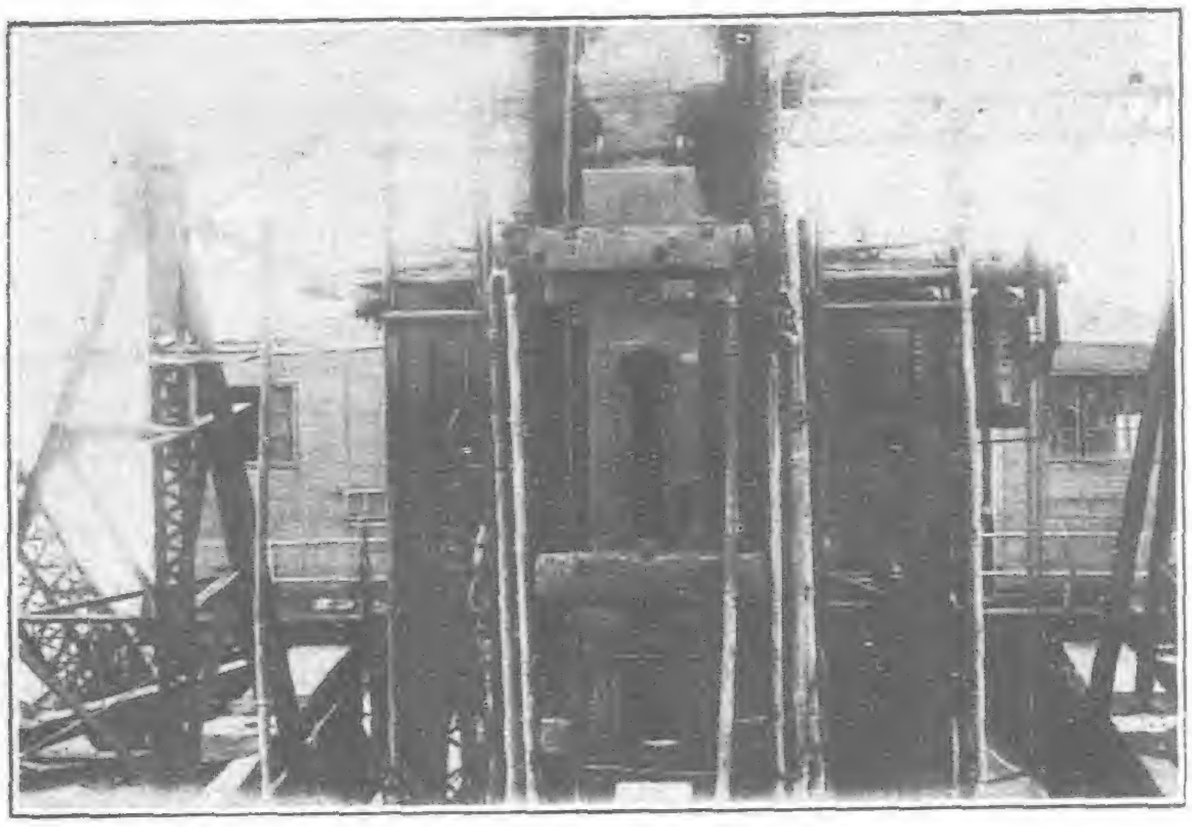
Derricks and Derrick Engines.—A 40 ton stiff leg derrick is bracketed to each of the forward corners of the hull for handling piles up to 80-ft. in length without the use of a stiffening or equalizing device and for handling piles above this length with a stiffening beam.

Each derrick is operated with an independent 10 by 12-in. double cylinder non-reversing hoisting engine (Starboard engine double drum, Port tripple drum), controlled by a bank of latched quadrant levers conveniently mounted in each derrick engine house so as to command a full view of the fall blocks; the tripple drum engine being used with the Port derrick which is equipped with an extra fall block required for handling the pile beam. "Swinging" is accomplished entirely by the manipulation of the forward spuds; pinning up with the Port spud causing the Starboard derrick boom to swing away from the leads, the opposite effect being obtained with the Starboard spud.

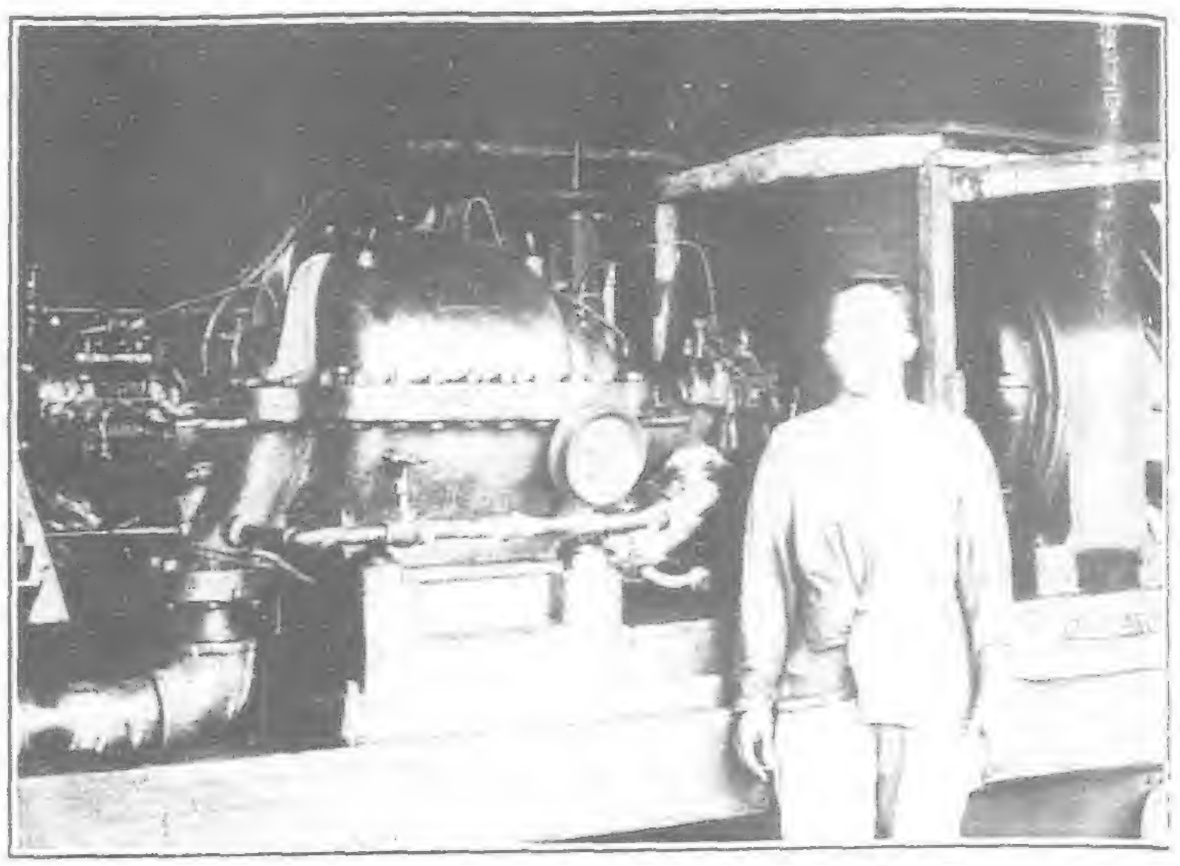
Pile Driving Operations.—The loaded pile barge is brought into position just in front of the leads. While the end of the barge is drawn slowly past the centre of the leads two members of the crew fasten the shackle of the pile line to the hairpin in the head of one of the piles. The barge is then drawn on until the pile is about centreed before the driver. With the barge stayed in this position, the crew attach the Port and Starboard hoisting rig to the socketed flat wire pile slings: the latter having been placed about each pile as it was loaded on the scow. The hoisting rig consists of a Port and Starboard eight part block set, reaved with ¾-in. plough steel cable, the head block of each set being suspended from the top of the leader frame. When hoisting 110-ft. piles the Starboard rig is attached to the pile at three points and the Port rig the same. Piles a 100-ft. long are raised by using 3 points of the Port rig and two points of the Starboard rig, while for those of 90-ft. but two points of each rig are attached. Two equilizing sheaves are used on both sets for 6 point suspension; one on the Starboard and two on the Port for 5 points and one each for 4 point suspension. The pile is next hoisted evenly in a horizontal position to an



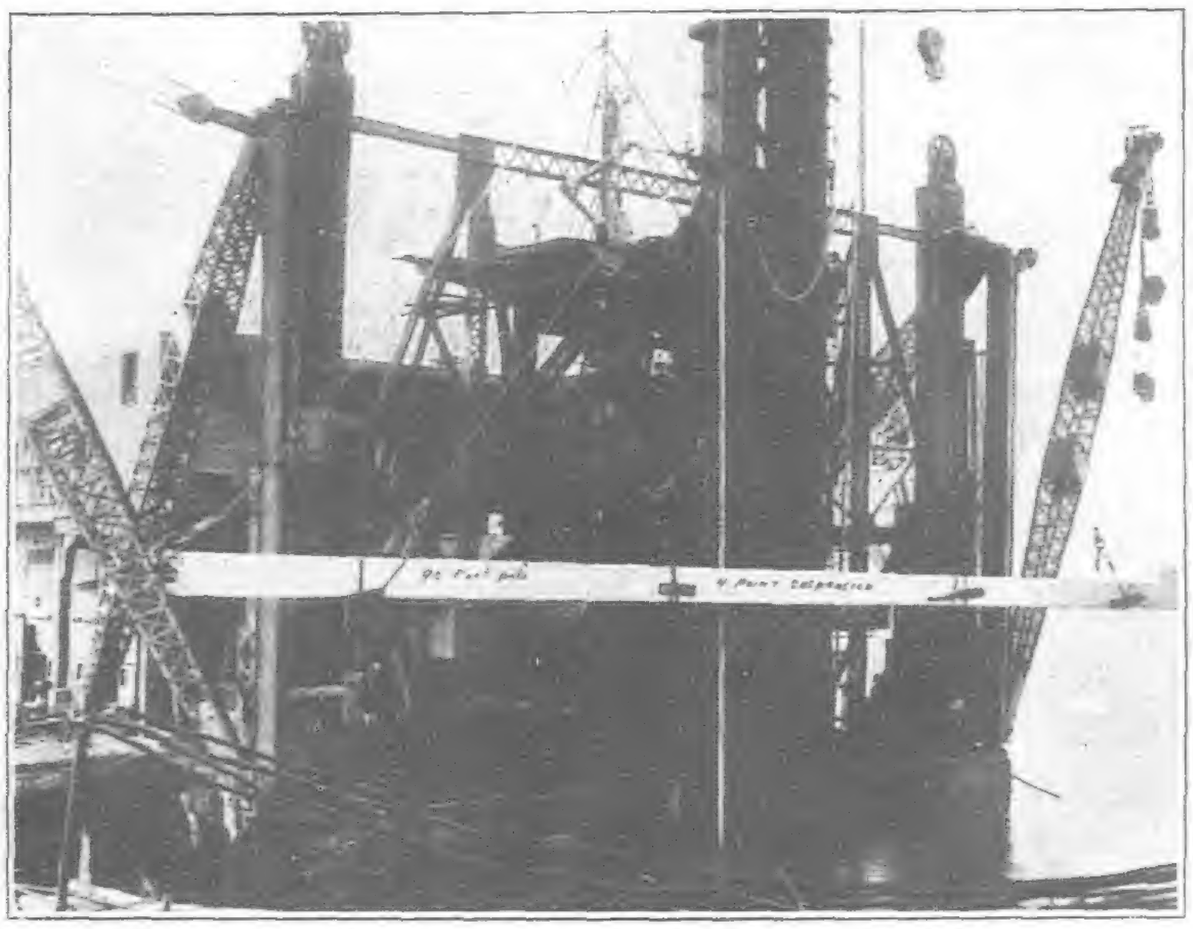
Operating Platform, Pile-driver "Mammoth"



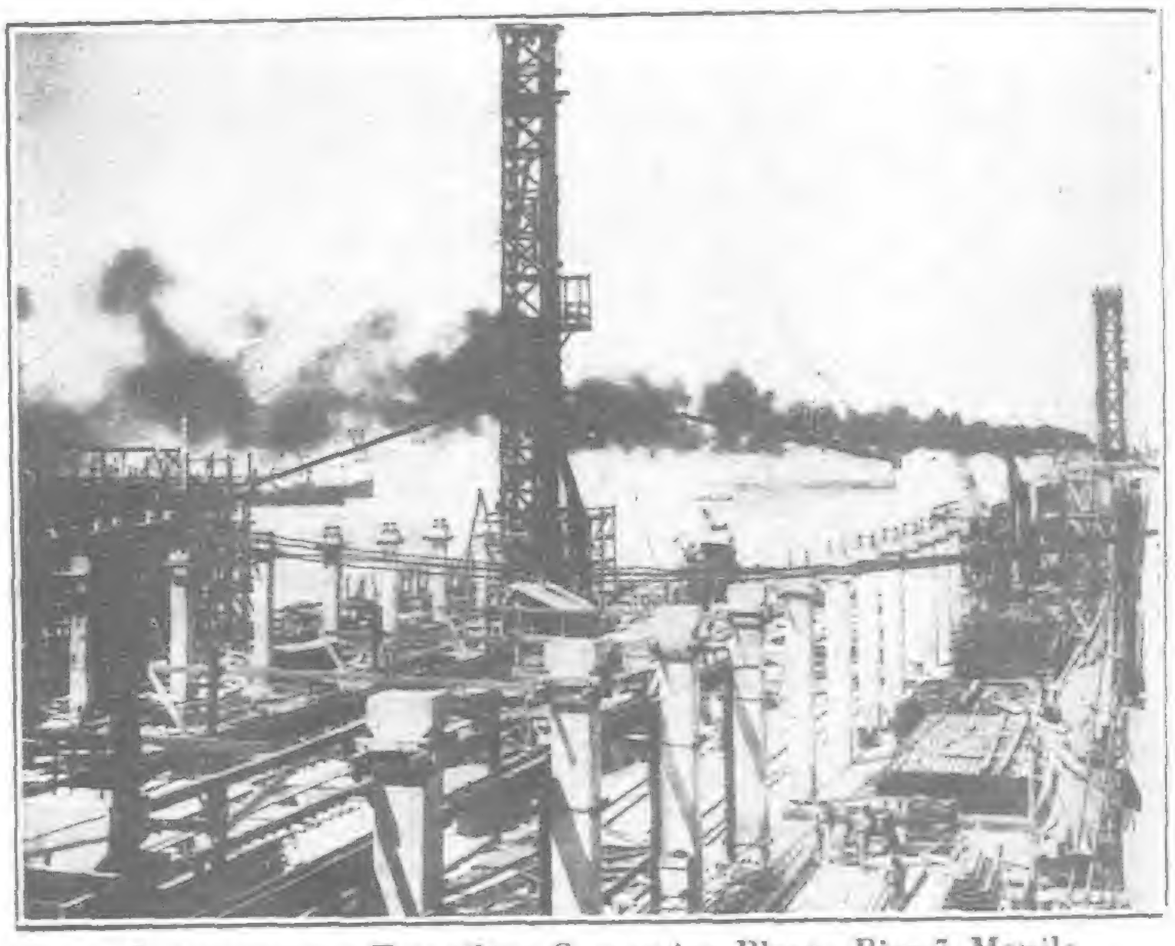
Special 32,000 Pound Steam in Operating Position
Pile-driver "Mammoth"



Battery of 4 Stage Centrifugal High Pressure Jets Pumps
Pile-driver "Mammoth"



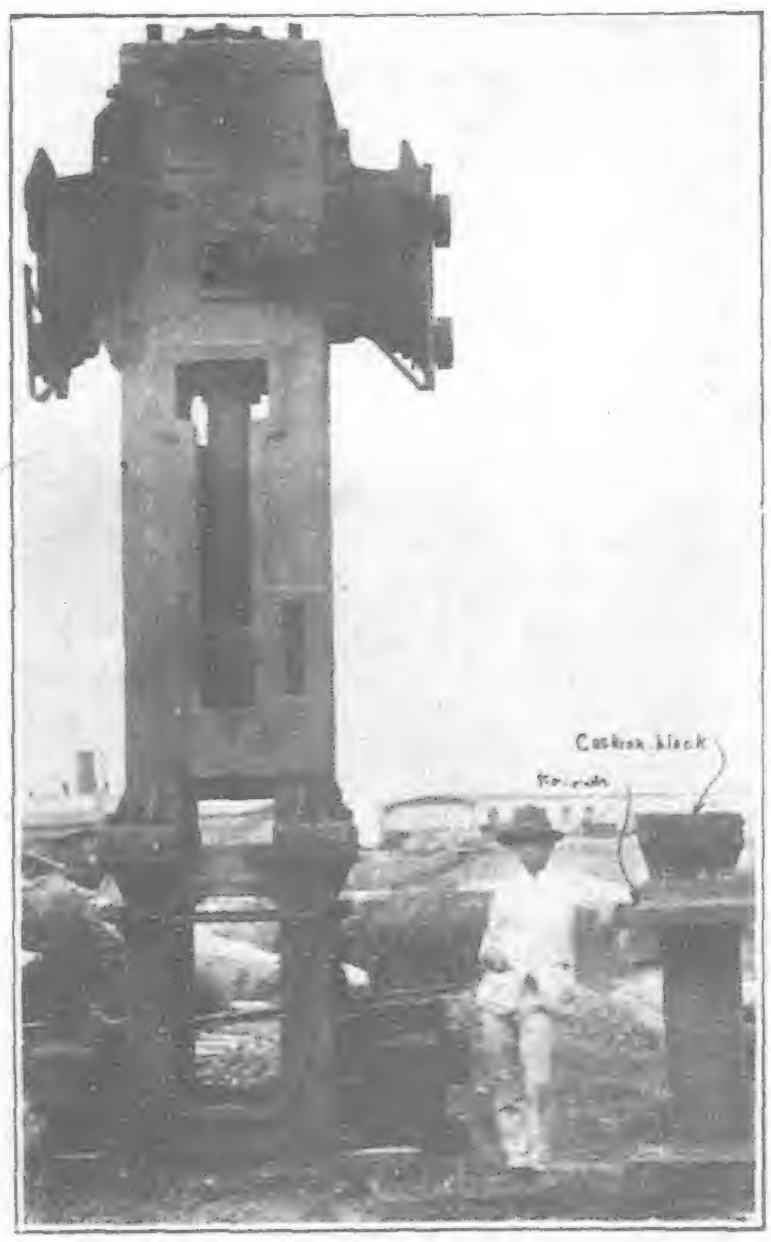
Pile Hoisted to a Horizontal Position 15-ft. above Deck Prepartory to Turning up into Leads-Pile-driver "Mammoth"



Superstructure Travelling Concreting Plant—Pier 7, Manila

Interior View—Pier 7

Interior View



Close View of Special Steam Hammer, Steel Follower and Cushion Block

View Showing High Pressure Jets Pile-driver "Mammoth"

elevation about 15-ft. above the deck of the driver. The pile barge is then drawn away and the Starboard rig hoisted, bringing the pile into a sloping position. During this operation and as the head of the pile rises, all slack is kept out of the pile hoist line but no appreciable strain is permitted on it. The Port rig is then slacked off free, thus transfering the entire weight of the pile to the Starboard rig, which bring the pile almost vertically under the Starboard side of the leads. Centering in the leads is now effected by burtoning to the pile hoist line.

No appreciable deflection occurs in the piles turned up into the leads by this method and a careful examination has failed to reveal cracking in any degree.

The pile is soon freed of the hoisting slings, and the upper and lower pile guides are turned up into position.

VERTICAL DRIVING.—After a pile has been suspended in the leads and stayed with pile guides, all spuds are raised and the driver is brought into approximate position by means of the usual head, stern and breast line which are all controlled by steam and held on dummy capstans. With the pile approximately spotted, or within a few feet of its proper position in either direction the forward spuds are run down and the stern spud is dropped. This fixes the position of the hull and the exact spotting of the pile is then accomplished by propelling the leader carriage either forward or aft and by moving the leads laterally in either direction. When the pile is correctly spotted it is lowered into the mud until it comes to rest; the heads of the 110-ft. piles usually standing 55-ft. above water at zero stage. The steam hammer is next run down and over the pile. The upper pile guide is then turned down to clear the hammer as pile and hammer move downward. The full weight of the hammer pushes the pile down approximately another 10-ft. leaving its head 45-ft. above water. The jets are next swung into position along side of the pile and are lowered and churned while steam is opened into the hammer.

From 15 to 55 minutes of continuous driving and jetting is usually required to get the piles down into the baquias, depending on the nature of the underlying strata of materials. Some piles have required 4 hours to drive due to encountering several relatively thick layers of sticky clay in certain parts of the area; most of this time, however was utilized in jetting and loosening up the material and not in hammering. The number of blows struck have varied from 1105 to 4430 in driving a pile to position. Aided by high pressure jets, the piles are being driven to refusal at grade without damage of any importance to the heads; a very little spawling at the edges of the pile taking place.

DRIVING BATTERS.—In driving batter piles the operations are similar to those for the vertical piles except that the bow of the driver has to be skewed off to make an angle of about 10 degrees with the transverse bent of piles in which the batter pile is to be driven to avoid striking the adjacent vertical piles driven in the same row with the point of the batter pile.

With leads battered to a 1:3 slope the pile is partly supported by the rollers of the upper and lower pile guildes and is lowered into the mud without injury to its skin. Only the jet which lies on the upper side of the pile can be used to assist driving a batter pile.

DRIVING PROGRESS.—With the method outlined above, of handling long piles from scow to leads, a maximum of 8 piles per 10 hour day can be driven. This number can be increased to 12, using the stiffening beam lifting rig for up-ending the piles, but the use of the beam method is limited to perfectly clam weather.

The stiffening beam is handled by the Port boom, but can be handled with either. By the beam-boom method a pile is swung in a horizontal position directly from the scow alongside to a position in front of the leads where it is up ended. In this way much time used in attaching and removing slings can be saved. Piles up to 80-ft. in length can be safely handled by the boom when slung at two points, without using a stiffening beam.

EXAMINATION OF PILES AFTER DRIVING.—To ascertain the condition of piles driven at various locations over the pier site where a variation in material was encountered in driving, a number of piles were pulled and carefully examined not only at the point but throughout the length of the pile. The examination revealed no damage whatsoever and indicated that the method of driving was satisfactory.

TEST OF BEARING POWER OF PILES.—As the depth of hard material varied considerably, at test load of 200 tons was applied to a few piles whenever a considerable amount of variation in penetration occurred. To avoid delaying the progress of the driver, special testing apparatus that could be quickly moved from one location to another was built.

This apparatus consists of a testing beam of structural steel; a hollow steel cylinder to set on the pile and two test barges. Heavy timber and lengitudinal wails are bolted against the pile selected for test and six others in line, about 4-ft. below zero tide. The steel cylinder is then placed over the protruding bars of the pile and is filled with dry sand. A rectangular wooden cap of hardwood cylindrical in form on to the underside is placed on top of the cylinder so as to bear on the sand and the test beam is raised and seated on the wooden cap. Both test scows are then floated in place, one on each side of the pile to be tested. This done, a cable is reaved around the sheaves in the cross frames located on the scows and over the sheaves in the test beam directly above, thence to the engine drums. The scows are then raised so as to be clear of the highest tide and are loaded with water and steel.

Under the maximum loading these piles are driven to support, an apparent settlement of 11 millimeters (about 27-64 of an inch) occurred, part of which was deformation. Under an additional loading of 100 tons a further settlement of 11 millimeters was recorded. Upon removal of all load, after the lapse of 15 days, a recovery of 8-½ millimeters (about 21-64 of an inch) was noted. Had the pile not been loaded beyond 100 tons the net settlement realized would probably have amounted to 3½ millimeters or approximately 9-64 of an inch.

CONSTRUCTION OF PIER SHED SUPERSTRUCTURE.—Concreting of the superstructure is carried on from a central mixing tower and chutting plant equipped with two one yard mixers and a double line of boom chutes mounted on a steel car. As work progresses, the plant is advanced down the centre of the pier on rails. A dinky locomotive brings up the aggregate and cement. All batches are mixed 2½ minutes.

All structural steel is assembled and riveted on the deck of the pier and erected in complete units by the locomotive crane.

COST OF PIER AND CARGO HANDLING EQUIPMENT.—The total cost of the completed pier and pier head including mechanical cargo handling equipment will be approximately $4,500,000.00.

MANUFACTURES OF CARGO HANDLING EQUIPMENT.—The gantry cranes were built by the Wellman-Seaver-Morgan Company while the interior cranes were built by the Shepard Electric Crane and Hoist Company and by Pawling and Harneschfeger. The Industrial trucking equipment was furnished by the Baker R. & L. Company of New York. Converters and other electrical equipment in the Substation was built by the Westinghouse Company.

MANUFACTURERS OF CONSTRUCTION EQUIPMENT.—The machinery on the driver was manufactured by several concerns. All of the principle machinery and structural parts were built by the Bucyrus Company of Millwaukee, Wisconsin, while the special steam hammer was made by the Union Iron Works of Hoboken, New Jersey. The derricks and anchor windlass were built by the American Hoist and Derrick Company.

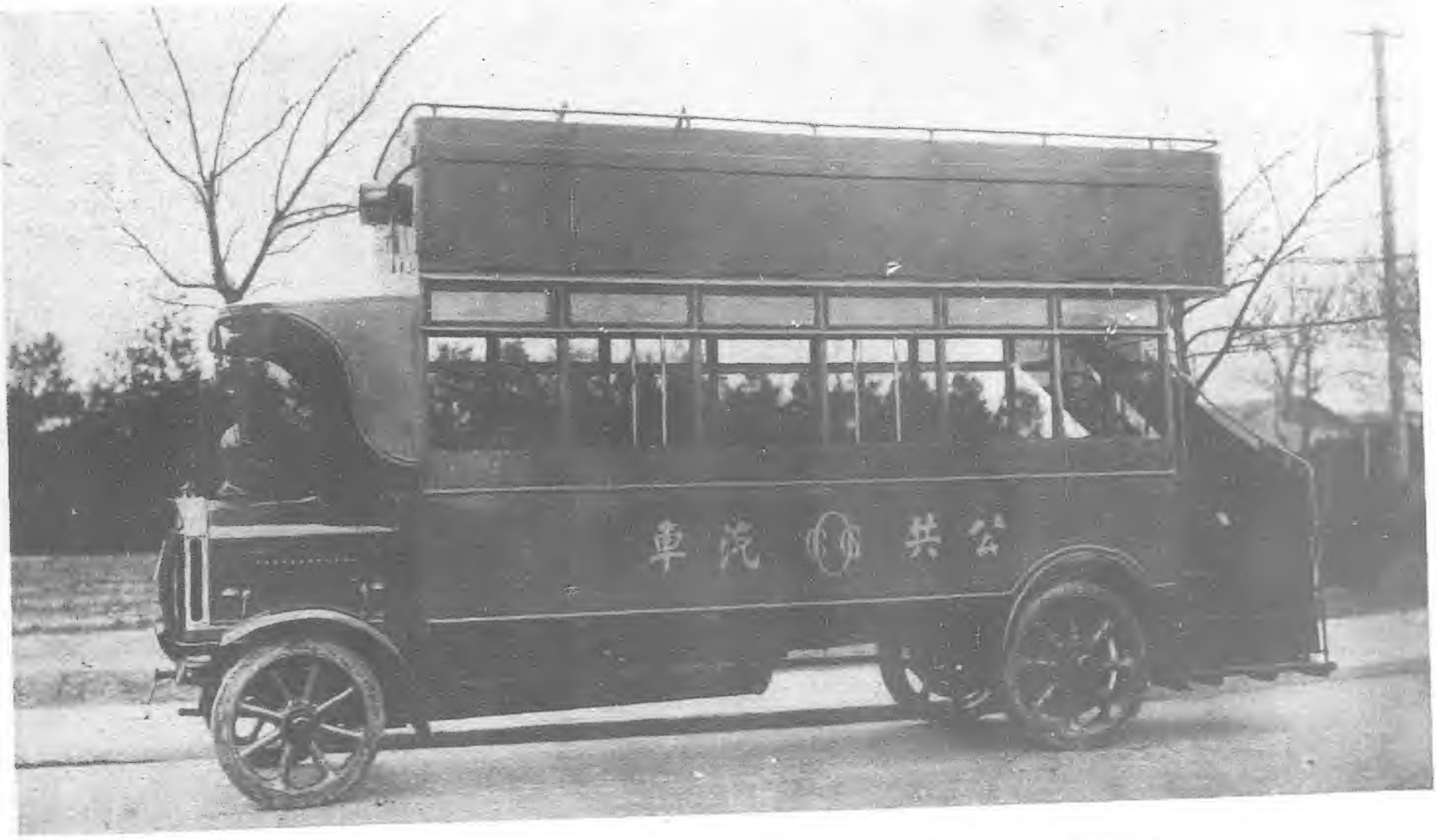
PERSONNEL.—The pier is being constructed for the Insular Government of the Philippine Islands by the Bureau of Public Works, under the immediate supervision of the writer as Chief Engineer of the project and Walter J. Grodske as project engineer. Plans for the pier and plant were prepared by the writer and developed under his personal supervision.

Acknowledgement is made of the loyal assistance rendered by Messrs. Leroy H. Thompson, mechanical engineer, Louis L. Vincent electrical engineer; Jean M. Allen and Ware Berry, driver superintendent—all of the Bureau of Public Works, Manila.

The Asiatic Motor

The first annual number of "THE ASIATIC MOTOR," appeared in March and clearly indicates that this magazine has come to stay. "THE ASIATIC MOTOR" is the official organ of the Automobile Club of China, the Hongkong Automobile Association and the North China Automobile Club.

The annual number contained interesting articles on automotive activities in the Far East and is plentifully illustrated.



Shanghai Gets Double Deckers

WE show a photograph of the new Double Deck Omnibus which the China General Omnibus Company hope to place on the streets of Shanghai in the near future: The Public have watched with great interest the progress which this company has made in the few months of its existance and have learned to appreciate the convenience and comfort of the fine Single Deck Saloon Buses which are now such a familiar sight in the streets. The arrival, therefore, of something new from this Company's workshops is awaited with keen interest.

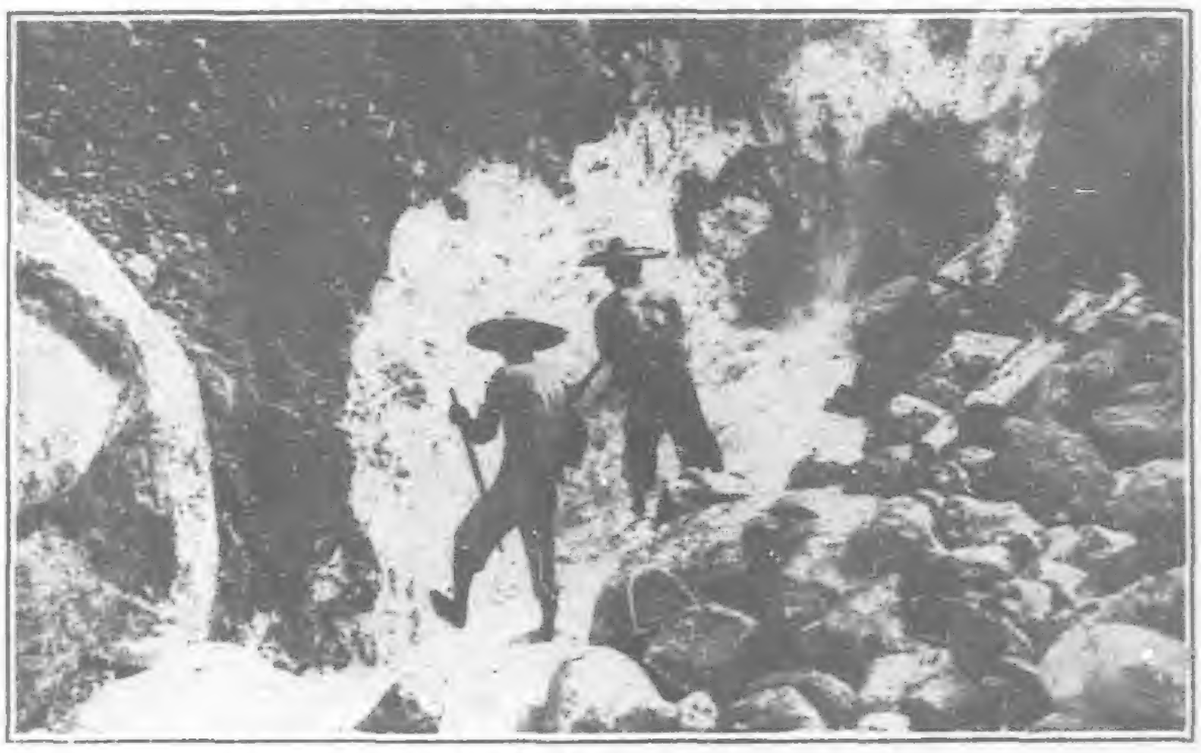
The body is of the well known London pattern with additional comfort to the passenger in the well sprung seats, similar to those already in use. The interior will seat 24 passengers all, except four, facing forward, these four being seated longitudinally over the

(*Continued on page 188.*)

Shanghai's New Busses

Chinese Women Cleaning Tin Ore

A group of Chinese women cleaning rough concentrates of ore by washing them in wooden pans. This is the most primitive method of dressing ore, but thanks to the skill attained by the workers it is effective. This washing in pans is largely used by Chinese and Malays to save the small amounts of tin that escape concentration on the mines and are washed away with the lighter grains or "tailings," and accounts for a large amount of tin ore annually. In the foreground are some half-coconut shells which are largely used by miners for concentrating small samples of ore.



A Small Chinese *Lampan*

A small ground-sluicing mine or *lampan* in which the water, seen falling in a small cascade on the right, is brought to the ore. The two Chinese are breaking up the soft tin-bearing ground with crowbars. It falls into the stream, where the water carries off the lighter constituents, leaving a concentrate of tin ore with heavy impurities which are separated later.

Landmarks in the Tin-Mining Industry

Leaving Primitive Chinese Methods Behind

By T. R. A. Windeatt, M.I.M.M.

ALTHOUGH it is well known that the main products of the Federated Malay States are tin and rubber, it is not so fully realized that the mining industry is mainly responsible for the rapid development and wonderful prosperity of the country. Records exist of tin-mining by Malays, Siamese, and Chinese at the time when the first Cornish mines were opened many centuries ago, but the production of Malayan tin, commonly known as "Straits tin," was not appreciable until the discovery of the Larut tin-fields in the State of Perak by Chinese miners. Mining operations were carried on under great difficulties: the country was in a state of anarchy, and faction fights were frequent among the numerous clans of Chinese. This led to an appeal by the ruling Prince of Perak to the British, then established in Singapore, Malacca, and Penang. In 1874 the Treaty of Pangkor was drawn up, and the existing system of administration was gradually evolved. Under equitable rule tin-mining prospered, and the richness of such fields as the Kinta Valley and Batang Padang in Perak, and the mining districts in Selangor became widely known.

The Chinese possessed no elaborate machinery, but excavated and washed the surface deposits with water from the hills nearby, employing large numbers of coolies for this purpose. Workings were generally limited to some 20-ft. or 30-ft. in depth, only very primitive pumps being available to keep the mines dry. Fortunately for these early miners, deposits were extraordinarily rich and tin ore was easily won, yet the output from the whole of the peninsula fifty years ago was estimate at less than 450 tons.

Stopping a Decline

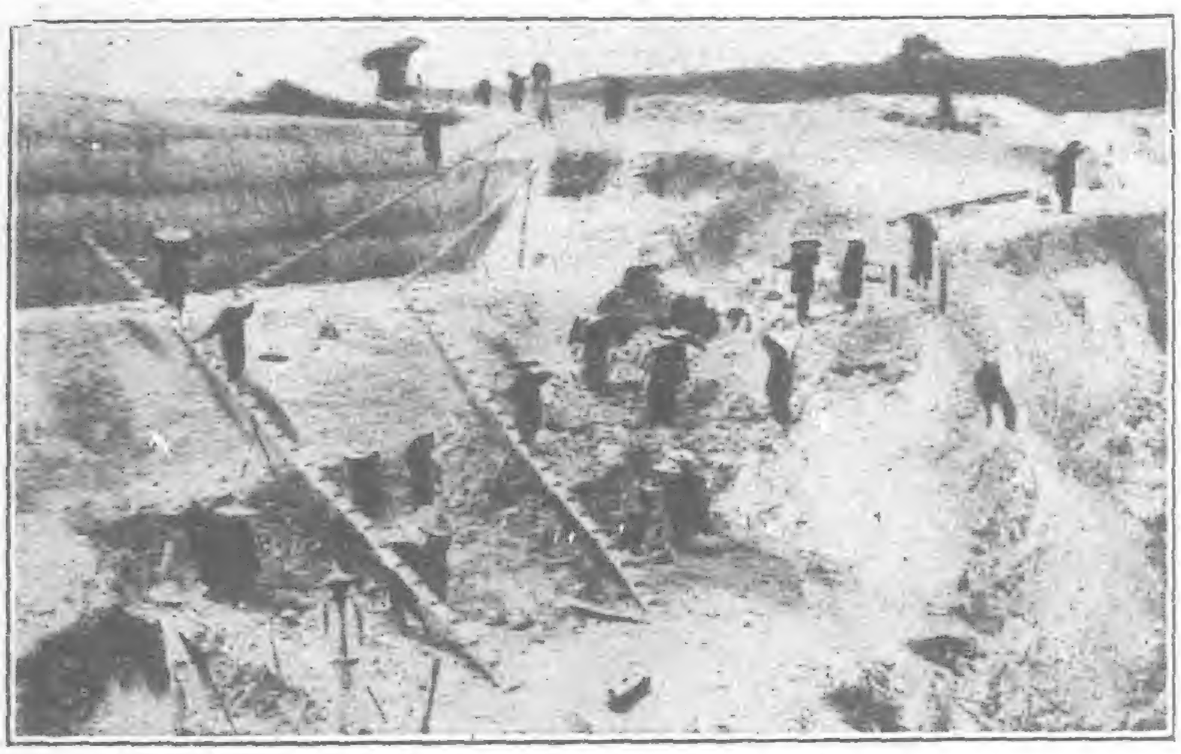
Following the introduction of what was virtually British rule, taxes were regularly collected, and the revenue derived from the mines provided funds for construction of roads and railways. These opened up the country, and rendered it suitable for the extensive

The Effect of Ground-Sluicing in the Mountains

Ground-sluicing can most readily be employed in hilly country where the steep slopes make it easy to conduct small streams of water wherever they are required. The effect of ground-sluicing on a large scale in the mountains is seen in this picture. Although such ground does not look promising for vegetation, it is surprising how soon a rank growth appears on it again. In some places old *lampans* such as this stretch for miles in the valleys and make rapid progress on foot impossible.

Part of a *Lampan* Showing Boulders Supported by Wood

Where big boulders are numerous the mountain streams effect a natural concentration of tin ore under them, and as this is very rich ground, the Chinese burrow under the boulders to win it, after diverting the stream if there is so much water as to make the ore inaccessible. The removal of the sand destroys the support of the boulders, and they have to be propped up with timber; but as the Chinese are careless about choosing props strong enough to bear the weight, it sometimes happens that the boulders fall and crush the miners underneath.



Women Working in an Open-Cast Mine

rubber estates, which may now be seen from Penang to Singapore. In 1904 the Federated Malay States exported nearly 52,000 tons of tin ore, or 56 per cent. of the world's output, the bulk of this amount being produced by Chinese mines. The output gradually declined, and in 1921 had fallen to 34,490 tons, but additional machinery installed by Europeans after the war caused an upward trend, and during the past year exported tin reached a total of 44,042 tons.

The geology of the mining-fields is complex. Briefly, tin deposits are alluvial, and are derived mainly from certain of the granite hills, which form the most prominent physical feature of the country; also, to a smaller extent, from instrusions into limestone, the bedrock in many of the important mining districts. Most of the large alluvial mines are situated on the western side of the peninsula, near the contacts of limestone and granite rock, where the highest tin content is usually found. Tin occurs as the oxide, cassiterite; in alluvial deposits it is frequently about the size of fine shot and resembles brown crystalline sand. It is noted for its exceptional purity, and may be found in alluvium consisting of sand, clay sand, or very stiff clay. Lodes of tin ore occur in the granite hills, but with the exception of Pahang Consolidated, Limited, where they are vigorously exploited, production amounting to some 1,600 tons annually, underground mining is at present of small importance.

The mining of alluvial deposits presents many varied problems, but the principles are the same throughout, from primitive Chinese workings to the most elaborate hydraulic mines and dredges. The alluvium is excavated, and, if necessary, puddled with water to set free the tin. The mixture is then passed into a stream of water flowing in a ditch or sluice provided with adjustable wooden slats or "riffles." The quantity and velocity of water in the sluice is so adjusted that its force is sufficient to carry away the lighter waste while leaving a concentrate of the heavy tin oxide behind the riffles. This concentrate is periodically removed, rewashed, and freed from the last impurities. After being bagged, either wet or dry, it is ready for sale to the smelting companies. Only after smelting does it assume the familiar metallic appearance of tin.

A Large Open-Cast Mine

A deep and extensive mine near Gopeng. On the far side of the mine are two inclined truck-ways, and in the foreground are rails for the trucks extending across the mine.

The Chinese still produce nearly half the tin from Malaya, but with a few notable exceptions their workings are primitive and small. For hill workings the Chinese lampan system is economical, but in the valleys and flats only very rich patches near the surface can yield profits when worked by hand labor. Gravel pumps, introduced from Australia, are now largely employed by Chinese to lift to the surface material excavated by hand. These plants are popular, chiefly because of the low capital expenditure necessary for their installation. Owing, however, to the inefficient portable steam engines used to drive the pumps and the cost of manual labour, ground cannot be treated unless it is of high value. To produce profits it is frequently impossible to avoid "picking the eyes out of the mine," and consequently large areas of land are rendered valueless.

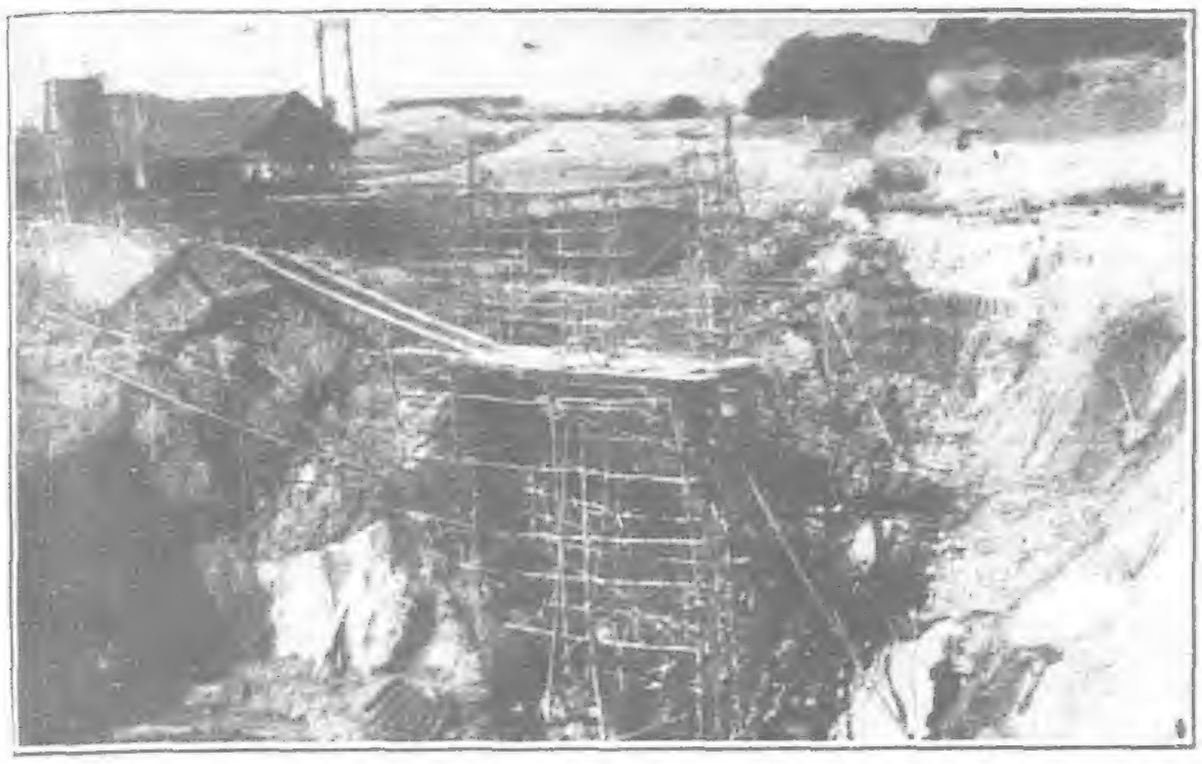
Early Chinese Enterprise

The Chinese deserve great credit for their early work and enterprise. Willing to take risks which appear highly speculative, it is not uncommon for large fortunes to-be made. A striking instance of this occurred last year in the Silibin district, near Ipoh, where a Chinese lady had been financing five or six coolies to work a small mine. Little, if any, profit had been made, but three weeks before her sub-lease was due to expire a pocket of almost pure tin oxide was struck. A scene of intense activity ensued. A continuous stream of coolies was employed ceaselessly loading tin straight from the mine into bullock-carts, and by the end of the month considerable wealth had been amassed.

An Open-Cast Mine with a Chinese Pump

Among the earliest European mining companies formed to work in Malaya Cornish capital was largely represented, and the hydraulic system was introduced for the treatment of hilly ground. A river is impounded high up in the hills by a dam, and a steel pipeline constructed from the dam to the property to be worked. The pipeline is so designed that on reaching the mine the water, due to gravity, has attained a pressure of from 100-lb. to 200-lb. to the square inch. It is distributed to the various working faces and discharged by monitors, or swivelling nozzles, against the hillside. The powerful jets of water rapidly cut into the stiffest clays, and the hillside is broken down, puddled, and run into sluice boxes, where concentration of the valuable mineral is effected.

A modification of this arrangement is employed to work flat ground. Open excavations, or paddocks, are cut by monitors, the broken material being lifted to sluice boxes at ground level by means of hydraulic jet elevators or gravel pumps. These mines frequently reach a depth of from 800-ft. to 100-ft., and cover an area of over ten acres. Gopeng Consolidated, Limited, the largest hydraulic tin mine in the world, exemplifies this system. The main pipeline (partially owned by Kinta Tin Mines, Limited) is eight miles long, 45-in., in diameter, and supplies 6,000 cubic feet per minute. In addition, a second pipeline brings to the mine a further 1,100 cubic feet of water per minute. Hand labor having been supplanted by water-power, visitors are invariably struck by the samll number of coolies to be seen. During the past year over 1½ million cubic yards were treated at less than ¾d. per



Scaffolding in a Chinese Mine

A Tin-Mining "Barge" with Gravel-Pump

yard, the cost of winning tin ore being approximately £25 per ton. Retention of sand and waste from such workings is a problem of considerable magnitude, and large tailings, dams, and spillways are necessary to prevent serious silting of rivers and streams.

The year 1912 saw a further landmark set up in the annals of tin-mining in Malaya. The Malayan Tin Dredging Company proved a bucket dredge capable of withstanding the heavy wear and of making a good recovery of tin from deposits overlying bed-rock of limestone pinnacles. To-day there are over forty dredges at work throughout the country, producing nearly one quarter of the tin from Malaya, and dredges are entirely responsible for the increase in the production of Straits tin.

Dredging is particularly suitable for working swamps, where the cost of keeping dry an open excavation would be prohibitive, but almost any flat land may be dredged, provided that the ground does not contain excessive quantities of timber, boulders, or clay. When a dredge is constructed the pontoon is built on solid ground and launched into the dredge pond, a small excavation filled with water some 8-ft. or 10-ft. deep. Steel superstructure is next erected on the floating pontoon, engines, boilers, winches, and pumps installed, sluice boxes built, and the ladder and bucket line set in place.

As the endless band of buckets rotates each bucket digs into the edge of the pond, the dredge being moved from one side to the other by wire ropes. The ladder is then lowered, allowing the buckets to cut at a deeper level, thus gradually deepening and widening the working face. A complete cut having been made, the dredge is pulled forward by a head line and the operation repeated. The material lefted in the buckets passes into a revolving cylindrical screen where it is broken and puddled by powerful jets of water. The sand and tin released pass through holes in the screen to sluice boxes, where the tin is recovered, while stones and lumps of clay roll to the end of the screen, and, together with tailings from the sluice boxes, are dumped astern. A dredge digs ground in front of the pond and dumps it after treatment at the back. In this manner the dredge and also the pond in which it floats can move forward over dry tracts of land.

The district surrounding Taiping, the capital of the State of Perak, has an interesting mining history. In the past it was vigorously worked by Chinese, who employed thousands of coolies in open-cast mines, but as the surface deposits were exhausted the mines closed down, and fifteen years ago these fields had been almost abandoned. With the introduction of the bucket dredge renewed interest was taken in all flat areas. The Taiping flats were prospected by Europeans, who found that tailings, together with virgin ground situated at too great a depth for the Chinese to reach, would yield good profits if worked by bucket dredges, Tekka Taipeng, Limited, was the earliest European company formed for dredging in this district, and Kamunting Tin, Limited, operated the first bucket dredge. There are now over a dozen at work, a number of which are controlled by strong Australian groups. Without exception, satisfactory returns have been produced by all these machines.

Improved Dredgers

Great progress has been made in dredge design, both in respect of reduction in cost of operation and increase in efficiency; some of the latest dredgers are capable of treating one and a half million cubic yards annually at a cost of about 4d. per yard. Mechanical rakes are being tested experimentally to reduce coolie labor in sluice boxes, and the Yukon Gold Company is operating two dredges on which the sluice boxes have been replaced by jigs. A recent innovation is the cutter dredge, three of which are at present undergoing running tests. The main difference between this type and the bucket dredge is the substitution of a revolving cutter and gravel pump for the bucket line. Highly efficient for harbor work, their adaption to mining is being watched with great interest.

A class of mining which has not been described is the open-cast system, where trucks running on inclined haulages bring to the surface material excavated by hand. This method is employed

Two Hydraulic Monitors at Work

A Monitor at Work. In the Foreground are Veins Containing Tin-ore

to work deep lead deposits of exceptional richness, such as those occurring at Tronoh Mines and the Lahat Mines in Perak, and Sungei Besi Mines in Selangor. Open paddocks have been worked at these mines to depths of over 200-ft. At Tronoh Mines the deep leads for many years yielded large profits, and when these were nearing exhaustion, bucket dredges were installed to work the flat portions of the property, and have proved highly successful in maintaing the fine record of this mine.

Mining land is prospected by means of bore-holes or pits sunk at regular intervals under skilled supervision. Material from the holes is measured, and, after washing, the concentrate of tin ore weighed. In conjuction with geological examination it is possible to make an accurate estimate of the tin content of any particular area and the profit to be derived on mining the land. Given suitable conditions, alluvial ground containing an average of one pound of tin oxide per ton, or .05 per cent., will yield large profits when worked by the hydraulic system or by dredging, and companies can be quoted which pay high dividends to shareholders by treating ground of half this value. In comparison, it is interesting to note that Cornish mines usually require some 20 pounds per ton to cover the costly underground exploitation and recovery of tin from rock.

Four Big Assets

In addition to the tinfields, Malaya possesses four great assets to the miner—viz., good native labor, ample fuel and timber, an equable climate, and excellent facilities for transport. Essentially an agriculturist, the Malay is little attracted by work at the mines, but the women are skilful at the concentration of tin by panning. The majority of laborers are Chinese, who prove very satisfactory under European direction. The Chinese coolie is a cheerful and willing worker, and when skilled commands high wages. He is loyal and reasonable, and in times of necessity will undergo considerable hardship on the mutual understanding that we will share in the good times which follow. Southern Indians are also employed, mainly on earthwork, but they are not physically so well fitted for heavy labour. Indentured coolies are not found in Malaya, and natives can leave their employment whenever they desire by giving due notice. The employer who treats his labor force fairly seldom has cause to complain of shortage of labor.

Administrative posts at the mines are usually held by British or Australian engineers, although practically all nationalities are represented. For such appointments it must be emphasized that technical training or practical engineering experience are not alone sufficient qualification. It is essential to select the right type of man, who will treat the natives with understanding and justice.

Until recently the only fuel burnt at the mines was jungle wood from the forests which cover the undeveloped interior and "bakau" from the extensive mangrove swamps friniging the coast. The discovery of coal at Rawang, in Selangor, was an event of far-reaching importance. The Rawang collieries now produce some 320,000 tons annually, which, though low in calorific value, has proved more economical than wood when burnt on mechanical grates. Coal is now used on many dredges and at nearly all the mines which generate electirc power. The growing need of miners for public supplies of electric power are as yet inadequately met. At Kuala Lumpur, the capital of Perak, however, a large station is in course of construction and a scheme for production of hydro-electric power estimated to cost several million pounds is at present under consideration.

The success of Malaya as a producer of tin is due in no small measure to the equable climate and splendid river system. Apart from two short periods rainfall, which averages some 90 inches per annum, is regular throughout the year, and during the dry seasons mining operations are but slightly curtailed. A glance at the mining returns of Nigeria will at once show the serious handicap of severe drought.

All land in the Federated Malay States is the property of the State, and mining land is held on lease. Leases are acquired from Government by direct application, or more frequently by means of a prospecting licence and subsequent selection of an area.

The main source of revenue to the State from the mining industry, apart from indirect taxation, is a dury on the export of tin. Thus is based on a sliding scale depending on the market price of tin and varies from 10 per cent. to 14.9 per cent. of the value; although heavy it is equitable when considered as payment for the land worked. Fees for licences and premium on land have been nominal, and the annual rental is one dollar (2s. 4d.) an acre. This policy of the Government has encouraged development of mines and enabled capitalization to be kept within sound economic limits.

Government officers of the Mines Department, under the Senior Warden of Mines, are responsible for the administration of the Mining Enactment and for all technical records, while the acquisition of land is dealt with by district officers and the Land Office. Mining interests are represented in the East by the Federated Malay States Chamber of Mines, and by the Malayan Chamber of Mines in London. The writer is happy to record the very cordial relations existing between these two bodies and the Government.

No article on Malayan mining could be complete without mention of the assistance rendered to the industry by the Government at the outbreak of the war and again in 1920. On each occasion the price of tin fell rapidly and the ore became unsaleable. The Government entered the market as a purchaser, on the second occasion in conjunction with the Straits Trading Company and the Dutch Government. Without such timely help the position at the mines would have been extremely serious, and it is gratifying that this enterprise of Government eventually returned a handsome profit.

The country is now in a state of transition. Primitive Chinese methods, so successful in the past, are becoming unprofitable, and the future of Malayan mining is dependent upon the treatment of low-grade areas on a large scale by efficient and economical machinery. When the alluvial flats are finally worked out—and few would have the temerity to estimate when that will be—there is every reason to believe that the industry will continue to flourish by working lodes in the hills.

New Tankers for Dutch East Indies

The Rotterdam Drydock and Shipbuilding Company have received a contract for the building of two new tankers from the Koninlijke Petroleum Maatschappij, for service in their trade.

Steel Piping Contract for Singapore

The Municipal Commissioners of Singapore have recently placed a considerable contract with Messrs. Stewart anh Lloyds, Ltd., for the supply of 18 miles of steel piping, of an average diameter of 36 inches.

Best Year for Dodge Brothers

(*Continued from page 168.*)

"Mr. Haynes, of course, insists that he is simply carrying out the principles that would have been followed by John F. and Horace E. Dodge, were they still in personal supervision. He began learning these principles just 25 years ago, having first met John Dodge on January 1, 1900, when he went to work for him. Mr. Dodge, at that time, was superintendent of the National Cycle and Automobile Co., of Hamilton, Ontario. The meeting with Horace Dodge followed a few months later. During the many years of their subsequent association, Mr. Haynes naturally had every opportunity to observe and analyze the methods and policies that brought the Dodge Brothers such great prominence and success and he has always said that as long as those principles continue to govern an institution, it will prosper.

"The continuous growth of Dodge Brothers is emphatic proof of the truth of this statement, but it must also be remembered that it requires tremendous vigor and initiative, as well as sound business judgment, to see that those principles are continually adhered to. That Mr. Haynes possesses these characteristics to a marked degree is evident from his record."

Mr. Nichols also expressed the belief that the year 1925 would be even more prosperous than 1924 and that production plans are being made accordingly. Dodge Brothers Dealers are uniformly optimistic and looking forward to a period of activity excelling that of the war days.

Kapok and its Uses*

Botanical Origin of the Fibre

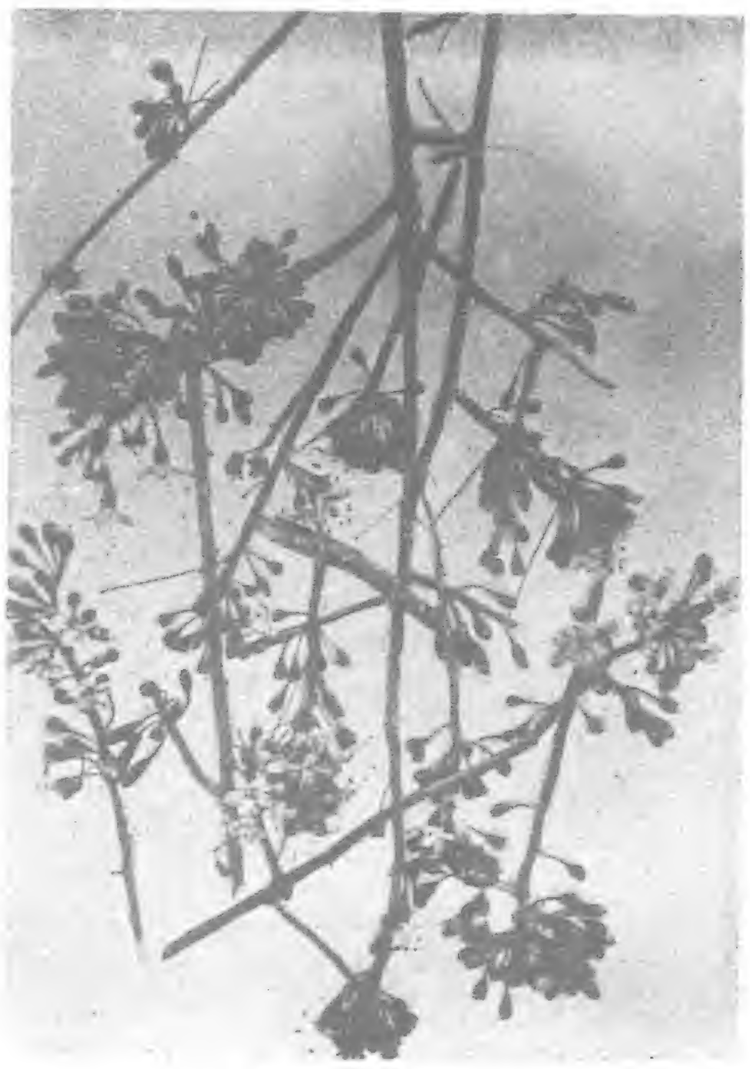
THE family of the Bombacaceæ is numerous and widely spread over tropical countries; its fruits contain a large quantity of silky fibre that envelops the seeds.

Even in former days these fibres were collected by the natives and used for various purposes, but it was not before the second half of the last century, when by way of trial some small parcels of these fibres were exported from Java to the Netherlands, that these vegetable silks became of more than local importance.

As the extraordinary properties of these fibres became better known, demand increased. Other tropical countries soon followed the example of Java, and paid special attention to the export of kapok.

Commercial Names for Vegetable Silks.—The fibres obtained from the Bombacaceæ, were formerly known by various names in commercial circles, such as kapok, silk cotton, pflanzendaunen, etc.

Of these names, that of *kapok*, under which the Java product was put on the market, has been generally adopted, while the others have fallen into disuse.



Kapok Blossoms

Unfortunately there is a tendency also to use the name of "kapok" for the products of the allied species of *Ceiba* and *Bombax* both belonging to the family of the Bombacaceæ, instead of restricting it to the product of the true kapok tree, the Ceiba Pentandra. In this artical the name *kapok* will exclusively be used for the tree (Ceiba Pentandra) and its product; in no case will it be used to denote any product of the allied species.

According to the botanical family from which it originates, the fibre varies considerably in properties, which is also evident from the considerable differences in price.

Attention must be given to another allied species of the Ceiba, viz., the Ceiba acuminata, growing wild in Southern Mexico and producing a silk floss, known there as pochote. The pochote, which has a shorter fibre than kapok is exported in small quantities only i.a. to the U.S.A. and it appears that the quality of the exported product varies greatly. As to buoyancy and resiliency it seems that pochote equals the Java kapok.

Kapok Picker Climbing Tree

The Origin of Kapok.—Java kapok, which is by far the best quality, is produced by the Ceiba Pentandra. Gaertn (=Eriodondron Anfractuosum D. C.), whereas fibres of lower value from British India, Cochin-China, etc., are obtained from the fruits of Bombax Malabaricum and other Bombax varieties.

The kapok tree is planted in many of the islands forming the Netherlands East Indian archipelago, more especially in Java, which alone is responsible for about 95 per cent. of the total exports of kapok from the Dutch East Indies.

The Distribution of the Kapok Tree in Java.—The kapok tree is chiefly found on native holdings and along fields and roads, but also on some 60 estates under European management, principally situated on the north coast of Java in the residencies of Samarang, Pekalongan and Surakarta, and yielding about 6 per cent. of the total Java crop.

With its straight trunk and its long horizontal branches almost devoid of twigs and its scanty foliage, the kapok tree presents a peculiar and a characteristic appearance.

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*Division of Commerce Department of Agriculture, Industry and Commerce, Buitenzorg (Java), 1925.

Transport of Kapok

Separating the Fibre, the Seeds, Husk and Core in the Shed

Drying of Kapok

Crop.—The fruits are harvested as soon as they are ripe, the fibre subsequently being separated from the seeds, the husk and the core in special factories.

The kapok is cleaned or partly cleaned by hand ; but in order to obtain a first class floss, its subsequent treatment by machinery is necessary. The seeds form a by-product and are used by oil manufacturers.

Further Preparation.—Thanks to the care bestowed on the preparation in Java, kapok, in the condition in which it is placed on the market, contains only few impurities, the manufacturer abroad having simply to remove these before proceeding with the carding.

Markets for Java Kapok.—The chief markets for Java kapok are in the first place the U. S. of America, followed by Australia and in the third place the Netherlands.

Formerly Amsterdam was the chief world market for kapok, where the consumers from the whole of Europe and America could cover their requirements. But the importance of the Netherlands as a central market enormously decreased during the war ; direct shipment to the United States came into prominence and showed a great development ; when taking into consideration the export to the Netherlands one should keep in mind that formerly Germany disposed of considerable and ever increasing quantities of kapok.

It is noticeable that the consumption of kapok in Great Britain, as is also the case in North European countries such as Denmark, Sweden and Norway, is still comparatively small.

Kapok as a Stuffing for Mattresses.—Whereas formerly the general idea was, that horsehair, crin végétal, cotton waste linters, etc., were the best and most healthy stuffing for mattresses, now that the admirable qualities of kapok for filling purposes are better known, this fibre has gradually taken the place of these stuffing materials which, although certainly less expensive, are inferior to kapok in every respect.

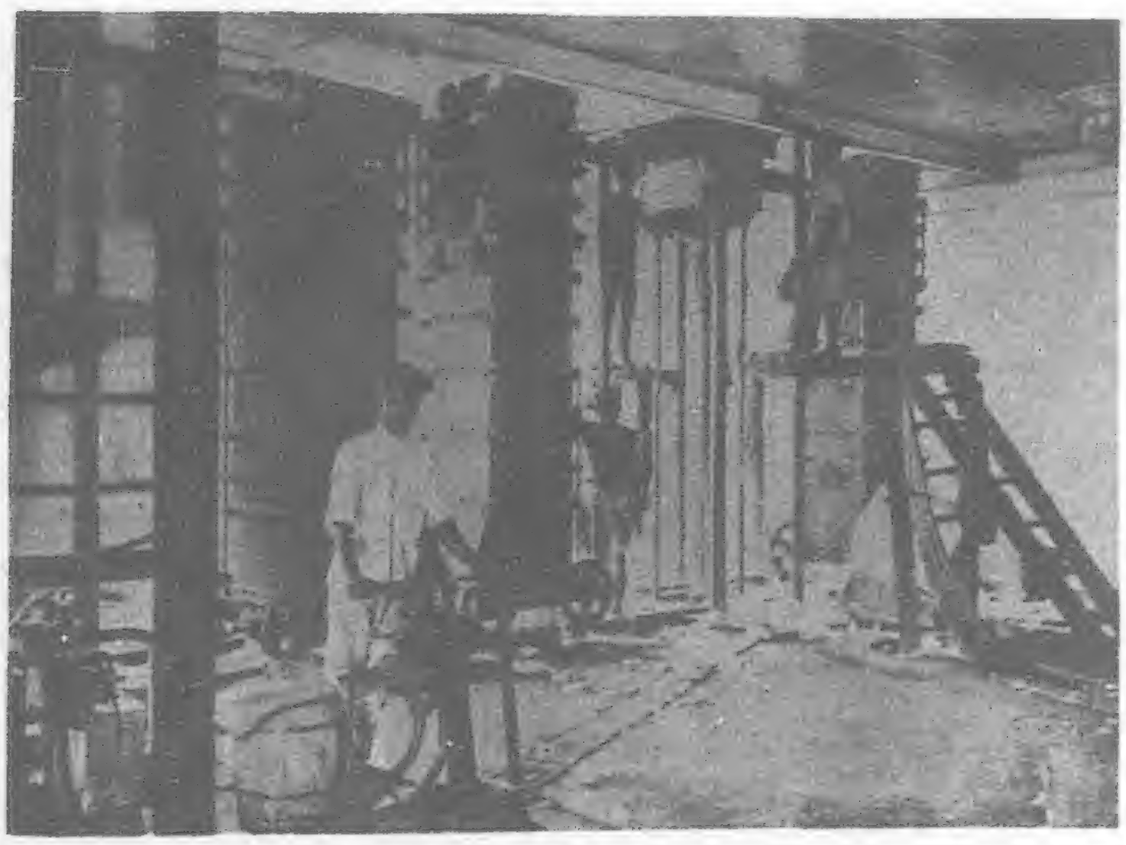
At the present time it may be said that kapok has commercially attained the foremost ranks of filling fibres and for these purposes it now enjoys an unlimited variety of uses which are constantly increasing. For purposes of upholstery its non-hygroscopic character, its softness and resiliency render it particularly suitable.

Kapok has the advantage above all other stuffing material of being a very resilient fibre, owing to which fact it has a great capacity for filling, *i.e.*, small quantities of the fibre are sufficient to fill large spaces, its elasticity moreover being of a most lasting nature. A mattress stuffed with kapok will resume its original dimensions as soon as a weight resting on it is removed. Matting and hardening after long use, such as in mattresses made from horsehair, crin végétal, woodshavings and seaweed, and the consequent necessity of opening and reshaping is unknown in mattresses stuffed with kapok. Moreover kapok as a vegetable fibre is less liable to harbor insects than the other materials employed in upholstery. Owing to its great capacity for filling, kapok mattresses are light and have the advantage of being easily handled.

As is clearly shown in the table below, the weight of the kapok necessary for a mattress of certain dimensions is less than in the case of the other stuffing materials mentioned above, in the long run the cost of a kapok mattress consequently being lower than a mattress of any other material.

A single mattress of 3 × 6⅓-ft. needs :

	lbs.		lbs.
Java kapok	.. 17.6—19 8	Crin Végétal	.. 26.4—28.6
Horsehair	.. 26.4—28.6	Alpine Grass	.. 25.4—28.6
Seaweed..	.. 33.0—35.2	Straw ..	.. 28.6—32.0
Woodshavings	.. 33.0—38.0		



Pressing and Baling Kapok

Kapok Factory Siloewak Sawangan at Pekalongan, Java

It might here be mentioned that when horsehair, crin végétal, etc., is used, the stuffing is mostly enclosed in a thin layer of kapok or cotton to give the mattress the necessary softness.

Flosses from different sources show great variety in elasticity; thus 20-lbs. of Java kapok will do the same work as 29-lbs. of British Indian Bombax floss.

The superiority of Java kapok is fully recognized by the well-known authority Sir George Watt, who in his standardwork: The commercial products of India (page 522) says: "the Indian floss has fetched less than that of Java.

"This is by some believed to be due to defective methods of collecting, cleaning, packing, pressing, etc., by others and perhaps with greater reason, as due either to climate or stock of plant grown.

"Certainly the opinion advanced by some writers (in the Indian press particularly) that *kapok* is but a Dutch name for the well-known *semal* cotton— the floss of *Bombax*—is quite erroneous; the floss of Eriodendron†) is far superior to that of *Bombax*, and the two must never be confused together."

Opponents of the kapok mattress declare, that one of the disadvantages of a kapok mattress is that it is less cool in summer. A proof of the unfounded nature of this assertion is the fact that kapok is universally used in tropical and subtropical regions for mattresses and cushions.

In addition to its great elasticity kapok fibre has several other properties, which give this vegetable silk the precedence of other stuffing material for mattresses.

Of these properties, the non-absorbent quality of kapok should be mentioned in the first place.

Kapok mattresses do not easily become damp and are consequently soon dried and once more ready for use, kapok that has been damp, not losing its former elasticity in drying.

The slow drying of other materials such as seaweed, and the consequent rapid rotting of the covers of the mattresses need not be feared when kapok is used.

The non-absorbent properties of kapok are possessed by none of the other materials mentioned.

Dry Sterilization of Kapok.—According to the authorities of the pasteur institute in Paris kapok can be sterilized by heat at least three times without losing any of its properties or being seriously damaged, whereas other upholstry materials do not usually survive this treatment more than twice. Therefore kapok should always be used as a stuffing material for mattresses in hospitals.

Thanks to these qualifications, in which kapok surpasses all other stuffing materials, its use for this purpose is rapidly increasing.

Kapok Mattresses in the Army.—Kapok mattresses are coming into use not only in the case of private individuals, but also in the armies of various countries. Before the war extensive experiments were made in the German army, with a view to comparing kapok mattresses with others. The result of these experiments, as already anticipated, was that the superiority of kapok was so clearly demonstrated, that it was soon definitely decided to use no other mattresses in the German army.

Kapok as Furniture Stuffing.—The qualifications of kapok, which give it the precedence of other materials for stuffing mattresses also causes it to be far preferable to horsehair as a stuffing material for furniture.

For the same reasons Java kapok is superior to so-called kapok of other origin.

Kapok as a Filling for Bandages in Surgical Dressings.—As a stuffing for bandages kapok is also being founf increasingly suitable for the following reasons:—

Kapok is elastic and does not become compact after long use.
Kapok does not absorb moisture.
Kapok can be dry sterilized.
Kapok is voluminous and consequently bandages stuffed with it are light.

Kapok as a Stuffing for Life-saving Appliances.—As is the case with other purposes for which kapok is employed, its use as a stuffing for life-saving appliances is strongly increasing, which is only natural considering the peculiar suitability of the fibre for that purpose.

The following qualifications are necessary in stuffing material for lifebelts and lifebuoys:—

1. Great buoyancy.
2. Even when submerged for some days, the buoyancy should still be retained.
3. After being dried, life-saving appliances should regain their original buoyancy as much as possible.

To what extent do stuffing materials as generally used comply with these demands?

On comparing the proved buoyancy of the different stuffing materials, to ascertain how many times their own weight they are able to carry when submerged, the following results are obtained:

Prime Jave kapok	25—30 times its own weight
British-India Bombax "kapok" ..	10—15 " " " "
Reindeer hair	11 " " " "
Cork	6 " " " "

The buoyancy of kapok is therefore about five times as great as that of cork and about three times that of reindeer hair.

These figures show that kapok is obviously far preferable to cork and reindeer hair for this purpose.

A lifebelt stuffed with 2-lbs. of Java kapok has a carrying capacity of at least 50-lbs.

All stuffings have the disadvantage that their buoyancy decreases with long submersion; whereas in the case of cork and reindeer hair this deterioration takes place quickly, with kapok the decrease is only 10 per cent. after 30 days submersion. As it will often happen that a life-saving appliance is submerged for several days, kapok is consequently highly preferable to other materials for this purpose.

Kapok also regains its original buoyancy after drying, a peculiarity which no other stuffing possesses, and which is of course of great importance in life-saving devices. Another advantage of kapok for this purpose is its disinclination to absorb moisture, owing to which damp kapok dries quickly and putrefaction of the covers of lifebelts, etc., is very unusual.

As kapok is a very voluminous article, life-saving appliances filled with this material will not adhere to and impede the movements of the drowning person. This cannot be said of all other materials.

In a general way it may be stated that cork is gradually being superseded by Java kapok; as appears from the specifications of the naval department, Prime Java kapok in the U. S. of America is a basis of the life-saving regulations.

Further Uses of Kapok.—The use of kapok as a textile has not met with the success expected by the different inventors. German textile experts have attempted to spin kapok by removing the ligneous parts, but the fibre then proved to have lost a good deal of its qualities. The chief difficulty of spinning is due to the fact that kapok fibre has a smooth slippery surface and therefore lacks cohesive force; moreover kapok fibre is short of staple, straight and brittle, while cotton fibre is long, tough and possesses a natural twist.

The very qualities that make it most valuable as a stuffing material, that is its resiliency and the tendency of the fibre to separate, are qualities diametrically opposed to those adapted to spinning. A spinning fibre should have felting properties and a tendency to cling together.

Consequently it is not probable that kapok will ever play a prominent part as a spinning fibre.

However, owing to the already mentioned qualities of kapok its application for other purposes may be expected in a greater measure. Kapok does not readily conduct warmth and has consequently already been widely used as a lining for aviators' clothing and in winter garments. For this purpose kapok is not spun, but is simply spread and stitched between two layers of the material. Articles of apparel thus treated have the advantage of being light, warm and cheap. On the same principle kapok has also been used in the manufacture of light, warm blankets that take the place of heavy and clumsy eiderdowns, woollen blankets, etc.

Lately kapok has been found to be an excellent stuffing material for refrigerators, for which purpose it is specially fit, as it is a poor conductor of heat and besides does not attract moisture.

Why Should Java Kapok be Preferred to Kapok of Different Origin? The answer is simple: Java kapok has a quantitative and a qualitative control of the world's market. Yearly exports of Java kapok amount from 12 to 17,000 tons, compared to which the exports from other kapok-producing countries are insignificant. Exports from the Philippines amount to no more than 300 tons, from Indo-China to about 70 tons, Ceylon exporting about 300 tons in 1922 and Ecuador 100 tons in 1920, etc.

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†Old name for Ceiba Pentandra Gaertn.

Java may consequently be said to practically supply the world's demand for kapok. Although this does not prove the qualitative superiority of Java kapok, the general preference for this product points to special qualities that are of great importance to merchants and manufacturers.

While in other countries kapok is a so-called small article to which attention is sporadically paid, *e.g.*, during favorable market conditions, in Java, kapok occupies a permanent place among the marketable products ; kapok is a so-called big article of standardised significance. Each year the trading association at the principal ports set up standard samples as a basis for transactions, arbitration offices settling any differences that may arise. In this way the foreign buyer is assured of the quality of the product that he has bought.

Packing and pressing are also carefully regulated. Moreover there is another advantage connected with the purchase of kapok in Java, *i.e.*, the certainty of exclusively obtaining kapok from the true kapok tree, Ceiba Pentandra, which is very often not the case with kapok from other producing countries.

No less important than this *botanical* purity is the *mechanical* purity of the product. Kapok from certain European managed estates in Java contains a maximum of seeds and impurities no higher than 0.3 per cent., the ordinary kapok exported having a percentage of seeds and impurities of 3, 5 or 7 per cent. according to the standard desired. The higher grade of purity of Java kapok consequently signifies a considerable economization of freights and especially of wages in the consuming countries.

Marketing of Kapok.—The trading associations in the two great ports of shipping have a special subdivision for kapok, which protects the interests of the Java kapok dealers. The stipulations of the kapok trade in Samarang, Sourabaya and Batavia are given below. As may be seen from the appended statistics, Samarang is the principal place of export for kapok, more than 50 per cent. of the export from Java being handled by that town. Sourabaya is the next in importance and finally Batavia. Formerly smaller quantities were exported by other Java ports, but during latter years kapok is shipped from the above-mentioned three principal ports only.

Every year standard samples of kapok are set up by the trading associations.

Sales are effected by the intermediacy of a broker ; in a standard contract the liabilities of both parties are laid down. In the case of a difference of opinion between the parties, this may be laid before the kapok arbitration office of the trading association concerned.

The Kapok Market at Samarang.—Prices are contracted on a bais of ci.f. net weight on shipping or net delivered weight.

Prices are fixed according to the unity of weight or money prevailing in the countries of destination (Holland guilder-cent per ½ K.G., England pence per lb., France francs per 100 K.G., U.S.A. $ cent per lb., Australia pence per lb.)

Settlements are usually made by means of 90 d/s and 60 d/s D/A draft against a confirmed irrevocable credit opened by the buyer ; 90 d/s however are of common usance.

Quality of the Kapok.—The qualities, which are generally handled at Samarang are the following : A contract, Prime Java kapok, containing a maximum of 3 per cent. of seeds and impurities, B contract, Prime Samarang kapok, with a maximum of 5, and C contract, Average Samarang kapok, with a maximum of 7 per cent. of seeds and impurities. Some European estates in the neighborhood of Samarang produce a very fine product containing a maximum of 0.3 per cent. of seeds ; these kapoks are bought at estate standard.

The U.S.A. generally order three qualities, viz., B and C and further the so-called America quality, ranging between B and C contract. New York, the chief market in the U.S.A., requires B and America quality, while sometimes even C quality is shipped to San Francisco.

Australia generally orders C quality, while also a great deal of the so called Australia quality is forwarded. It is impossible to give a definite description of this quality ; in a general way its quality is an off-C, but it is impossible to state how much this quality is below the C. In this respect the sellers at Samarang follow the suggestions of their buyers in Australia.

Lately this country, however, showed an increasing interest in good qualities with a consequent increase in demand for B contract.

Europe requires A and B qualities only. Holland usually contracts for Prime Java, but only with a view to the seeds and impurities, as the staple and color of B are quite sufficient.

England, France, Spain and Scandinavia generally order B contract.

Packing.—For export the kapok is pressed in gunny bags which are reinforced by iron hoops.

Generally double bales, containing 100 K.G. net of kapok are shipped. The pressing differs according to the destination. While Holland requires pressing to a maximum of 4 piculs* to the cubic metre, other countries in Europe require a heavier pressing : for these countries pressing of 4.65 to 4.75 piculs to the cubic metre is applied.

America too requires a heavy pressing of about 4.75 picul to the cubic metre with a content per bale of about 100 K. G. net of kapok.

Packing for Australia generally takes place in double bales weighing from 160 to 170-lbs. and measuring 10/12 cubic feet. This works out at a maximum of 4.40 piculs to the cubic metre. Kapok, however, is also shipped to Australia in single bales weighing 100 to 110-lbs. and measuring 8/10 cubic feet. This works out at a maximum of about 3.50 piculs to the cubic metre.

The Kapok Market at Sourabaya.—Generally speaking the conditions attached to kapok for export correspond to those usual at Samarang.

The assortment, however, is different. In the local market at Sourabaya three qualities are transacted, *i.e.*, Prime Madura, Prime Porrong and Prime East Java.

Prime Java in which the above-mentioned qualities of Prime Porrong and Prime Madura are included, is sold to Holland. Prime East Java does not belong to this quality. Inferior qualities are not delivered by contract, but are sold at auctions.

America imports Prime East Java as well as Prime Porrong and Prime Madura under these names.

As a rule the inferior qualities are exported to Australia, but during latter years Australia has also been appearing on the market for the better qualities of Prime Madura and Prime Porrong

Conditions for pressing, packing and paying practically correspond with those at Samarang.

The Kapok Market at Batavia.—The market for this article is of no great importance ; supplies, chiefly from the residency of Bantam, are small and the quality is not judged as favorably as the Samarang or Sourabaya kapok, though it must be stated that the average kapok is very clean and pure. In contrast to Samarang and East Java the kapok at Batavia is sold at gross weight for net weight, in which case one should allow about 5¾ per cent. for tare. The kapok should only contain 1½ per cent. of impurities. As a consequence of the imperfect pressing installations, pressing generally does not exceed three piculs to the cubic metre, and that only for Bantam kapok, while pressing of other kapok is considerably less.

* 1 picul=61.76 K.G.

Shanghai Gets Double Deckers

(*Continued from page 180*).

wheel arches and permitting a small vestible at the entrance to facilitate ingress and egress. Access to the upper deck is by means of an stairway from the back platform, this upper deck being accomderted with comfortable garden seats. In accordance with Police Regulations safety gates will be fitted to the steps, so that jumping on or off a bus whilst it is in motion will be prohibited.

The body is fitted to a Tilling Stevens chassis similar to that used under the Single Deck Bodies. This chassis, as described in a previous issue, is of the Petrol Electric type without clutch or gearbos. The absence of these accessories renders the "get away" most smooth and completely does away with the jerks that are almost always produced by the average driver when using his clutch.

The upper deck will be a complete novelty to Shanghai, and, as it is said that the only way in which to see London is from the top of a Bus, opportunities will now be given to residents and visitors alike of viewing our city from an entirely different view point.

Siam Cement Works

An Up-to-Date Plant at Bangsue

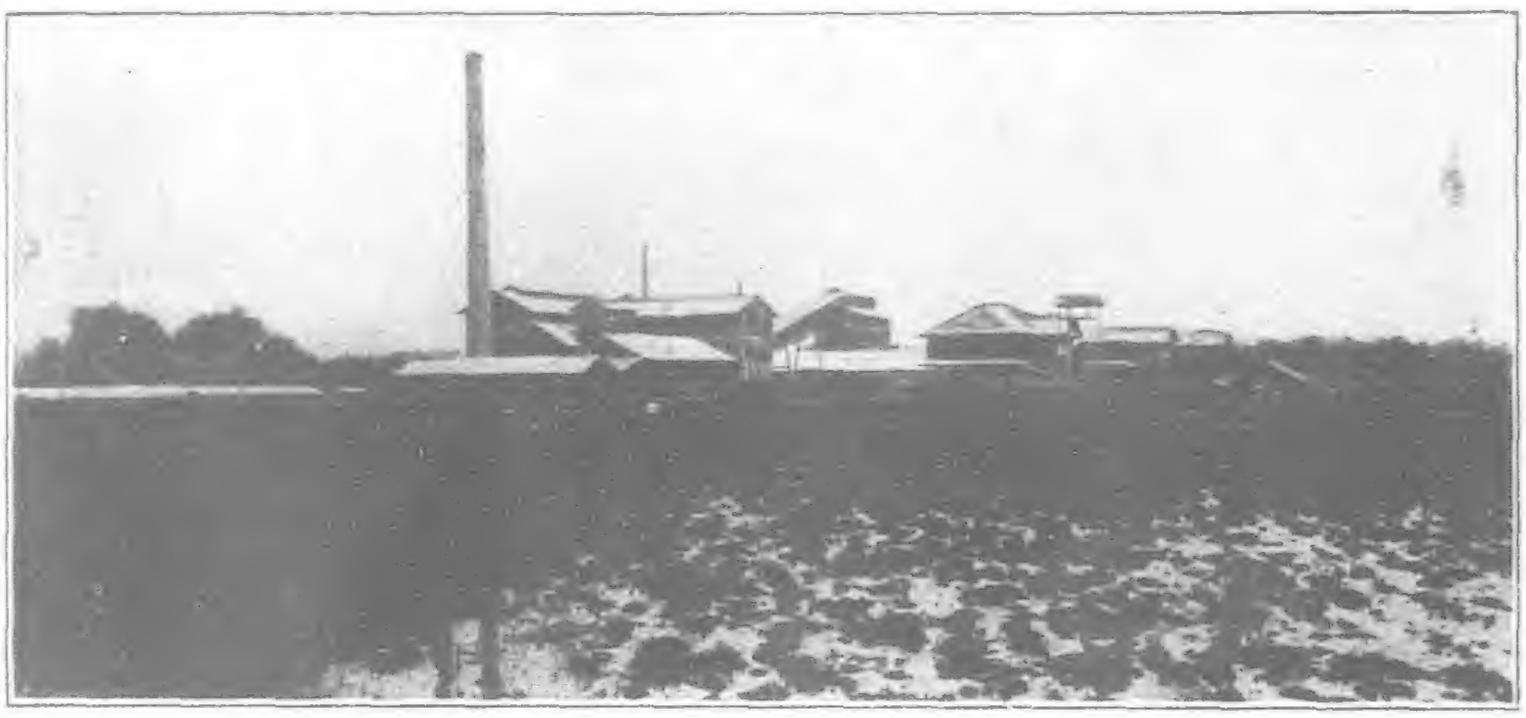
IT is well known that a few of the industries which have recently been started in Siam have a generation of usefulness behind them, and have become widely known because of the prominent part they take in the development of the resources of the country. Others there are of equal importance, but their value has undoubtedly been overlooked because of their potentialities.

Perhaps one of the newest of Siam's larger industries is that of making cement, and the business promises well. In past years Siam has consumed huge quantities of cement in her railways and other constructional works, and what has already been consumed is infinitesimal to what will be required in the days to come.

Everywhere one sees works of public utility in progress. Railway extensions, bridges, new wharves and warehouses, and new buildings are being erected, and these plans for the further development of Siam all call for this important article.

In former days most of the cement was imported either from Hongkong or Haiphong, and we have heard of shipments coming from Europe. But it has now been proved that as good a cement can be made in this country as elsewhere, and the Siam Cement Co., Ltd. has proved it. This is practically a new company, being floated in 1913, but its future is assured. It can turn out all the cement that is required in Siam ; and those who take an interest in construction work and in cement making should visit this plant at Bangsue, where they will be cordially received by the genial managing-director, Mr. Oscar Schultz.

Now, although cement is the commodity on which this company was established, this is not only its sphere of activities, for it can manufacture fire-clay and stoneware goods, if required. This, however, is not being done at present, as there is very little demand locally for this class of goods. The plant at Bangsue is thoroughly up-to-date and of a standard equipment designed and constructed by F. L. Schmidt & Co. of Copenhagen.



PORTLAND CEMENT WORKS IN SIAM

Working on the wet process, oil used as fuel for the rotary kiln. Constructed to F. L. Smidth & Co.'s design and equipped with their machinery

We find there machinery of the most modern type, which includes a rotary kiln, 35 metres in length. The power to drive this plant is obtained from the Samsen power station. The current received is about 3,500 volts, but this is reduced to 500 volts ; and a load of about 400 k.w. is constantly in use. The output now is about 140,000 barrels annually, but when the work of extending and improving the plant is completed—at about the end of the year—and the installation of a new rotary kiln, 56 metres long—the total capacity of the factory will then be about 300,000 casks a year. The machinery is controlled by one switch gear, which provides for the running of all, or any section, of the plant, besides which there are automatic switch boxes attached to each motor.

Leaving the power house we come to the investigation of the actual cement manufacturing plant, and here we learn the general principles underlying the production of cement. Portland cement is made by the calcination to incipient fusion, *i.e.*, till almost melting, and subsequent grinding of a mixture of calcareous and argillaceous materials of such a composition as to chemically saturate one another during the process of manufacture. In order to achieve this end, it is necessary for the raw materials to be not only carefully proportioned, but also to be very finely ground, so that the particles of calcareous matter may be in intimate contact with the particles of argillaceous matter, and that when they are subjected to the fire, proper chemical combination takes place.

The first stage of manufacture, therefore, concerns itself with the preparation of the raw materials prior to being burned. This preparation, which is the most important process in the whole of the manufacture, consists of—

(1) Correctly proportioning
(2) Finely grinding, and
(3) Intimately mixing the ingredients.

The raw materials used are chalk and clay. The chalk is obtained from Chongkae and Ban Moh, while clay is procured on the spot, at Bangsue, where there is a good supply.

The method of preparing the raw material is interesting. The clay and chalk are first broken down to a thin " slurry " in ordinary wash mills, and is pumped through to a tube mill, having a charge of 4,000 kilos of pebbles, which makes for fine grinding. These wash mills are ten metres in diameter. From the tube mill the material is transferred to four storage tanks, each with a holding capacity of 200 cubic metres.

This way is called manufacturing by the " wet process," which is considered to be the best method, as it has been found that handling raw materials in a wet state ensures a more thorough mixing, and a better cement results.

From the tanks the wet mixture is pumped into the rotary kiln, where the burning takes place. The burnt cement then leaves the kiln in the form of nodules and goes to the cement mill, which consists of a ball mill, having a charge of 3,000 kilos of steel balls, and a tube mill, with a charge of 4,000 kilos of pebbles.

This is done by pumping the mixture into a tank on the top of the kiln house, whence it is fed by gravity to the rotary kiln. This revolving furnace has a slight slope to enable the mixture to travel slowly from one end of the kiln to the other, thus meeting the fire in its progress and being slowly raised to the full temperature of calcination. The kilns are fired at the lower end by means of finely powdered coal, blown into the kiln with compressed air. At the hottest part of the kiln, an intense white heat is obtained, at which temperature the two ingredients integrate chemically, and form the compounds which are essentilly Portland cement, but the material leaves the kiln as a kind of hard black gravel—technically termed " cement clinker."

The cement clinker, after being cooled in a blast of cold air, is turned out in the compound for a few weeks, in order to " mature." It is then fed into a set of mills, somewhat similar to those at the raw material end. A small addition of gypsum is made at this stage in order to control the setting time of the finished cement. After passing through these mills, the material appears as the well-known Portland cement, and is led away over a belt conveyor to the store.

The whole of the raw material preparation is under the supervision of a well-equipped laboratory. During the day seventy-two samples are taken at the various stages of manufacture and carefully tested, and any adjustments made in accordance with the tests obtained, so as to ensure a cement of good quality being produced. It is in this way we have tried to describe, without going into technical language, that cement is made.

The Siam Cement Works occupy about thirty acres of land at Bangsue, and there is a railway siding in the compound for the prompt despatch of its products. It has a labor force of 190 Siamese men and 30 women, and about 100 Chinese workmen.

Foresight in Railway Construction

Twenty Years' Needs Fully Provided For

By P. A. Anthony (late General Manager F.M.S. Railways)

WHAT are known as the Federated Malay States Railways cover the whole system of British Malaya, not only in the four Federated States, Perak, Selangor, Negri Sembilan, and Pahang, but in the territories of the Straits Settlements—that is, Malacca, Province Wellesley, and Singapore, besides the Unfederated States of Kedah, Perlis, Kelantan, and Johore. With one exception all these lines are the property of the Federated Malay States Government, the exception being the railway—part of the main line—some 120 miles in length through the State of Johore, which belongs to that State, but is leased and operated by the Federated Malay States Railway Administration.

All the railways are of the metre gauge and, thanks to the wise judgment of consulting engineers in earlier years and to the fortuitous circumstance that there was no great stint of money, a high standard was adopted from the outset and easy curves and gradients obtain through country involving heavy earthworks and bridging and a high cost per mile for construction. This early policy, consistently followed, has been fully justified by results, and Malaya has now over a thousand miles of railway of sound construction, well equipped and maintained, and fully equal to the work which will be required of it during the next twenty years. At all the more important stations yards have been laid out on a large scale, such portion of the work as is necessary for the immediate future being put in, leaving ample room for expansion at reasonable cost.

The main line traverses the western coast of the peninsula from Singapore to the Siamese border north of the small State of Perlis; there are connections by rail with the coast ports at Singapore, Port Swettenham, Prai and Penang, Malacca, Port Dickson, Teluk Anson, and Port Weld, of which the first three are ocean ports. On the eastern side of the peninsula a line is being constructed northwards from Gemas, immediately outside the Johore boundary through Negri Sembilan, Pahang, and Kelantan, joining up with a branch of the Siamese State Railway, which has been built through the State of Patani. This railway is complete with the exception of a gap of about one hundred miles now under construction. It is almost entirely a development line, opening up a large tract of jungle-covered country, which in course of time will become flourishing plantations, but it forms also an alternative route between Singapore and Bangkok, the Siamese capital.

The F.M.S. Railway Station Kuala Lumpur

The Federated Malay States Railways linked up with the Siamese State Railways in 1917, the junction being made at Padang Besar on the Perlis-Siamese frontier. A considerable and steadily increasing traffic has grown up as a result of the excellent facilities which the railway affords, Siam exporting large quantities of rice, pigs, cattle, and poultry, whilst a biweekly express passenger service between Penang and Bangkok has proved very successful, and is rapidly becoming a popular tourist route. The journey occupies two days and a night, some 36 hours, and the service has brought Siam a week nearer Europe. Exceedingly comfortable day and night coaches, besides restaurant cars, have been provided by the Siamese Railway Administration, and the journey can be made with the greatest comfort, particularly during the period when the north-east monsoon is blowing, as the temperature is moderate and pleasant, whilst the discomfort of the rough weather in the China Sea is avoided.

The journey between Singapore and Penang takes 24 hours in each direction; there are two through services daily, one leaving in the morning and the other at night, both from Penang and Singapore. There are admirable sleeping and restaurant cars, and every possible effort has been made to render the journey as pleasant as possible—no easy task during the intense heat of the day. To the tourist the journey is of considerable interest, particularly if the northern half of the trip is taken by day. Very little of the jungle which formerly covered the land remains in the neighbourhood of the railway, but it will be observed that all the distant hills and mountains are forest clad to their topmost ranges, even if 5,000 or 6,000-ft. high. A mountain range extends down the centre of the peninsula like a backbone, and is noticeable at various points on the railway journey.

Practically all the railways have been built by the departments' own construction staff, a method which has proved economical and satisfactory also from the point of view of the substantial character of the work done. Malaya is not a country for cheap railway construction, the great rain fall, 100 to 200 and 300-in. in the hills, and the consequent great floods, the

Railway Offices, Penang

treacherous nature of the ground and its tendency to slip, the numerous rivers (many of them are of considerable size in flood-time) require thoroughly substantial work being put in, and this is necessarily expensive. The organization was formed some 25 years ago, and has been increased or diminished according to the financial or other circumstances prevailing. A nucleus has, however, always been maintained, and a number of the sub-contractors and others have worked for the department for many years.

The engineers employed on railway construction are usually recruited through the Crown agents for the Colonies, as also are all the Europeans employed by the railway department. Construction engineers are engaged on agreement for three or four years with possible extension, preference being given to those who are unmarried and who have had experience in tropical countries. With the exception of a small staff of accountants, storekeepers, and works foremen, there are no other openings for Europeans on railway construction.

The work itself is carried on by a system of petty contracts, earthworks, bridge work, and laying and ballasting of the permanent way, and so on being given out in the form of piece-work contracts to Chinese, Bengalis, and Tamil Indian labour, and to Malays. Even the wild and timid Sakais, the aboriginal race of negritos who live in the remoter forests, can sometimes be induced to do such work as jungle clearing. This method of carrying out work is very popular with the Chinese, who love any enterprise where there is an element of uncertainty as to the amount of profit which can be made and where long hours and industry bring a greater reward. Many of these men have followed the work of the department for years, some have retired with modest fortunes, and in certain instances have invested their savings in rubber and other tropical products planted on land adjacent to the railway which they helped to build with such cheerful perseverance.

A notable engineering work completed in 1924 was a bridge over the Kelantan River on the eastern line already described. This fine structure consists of five spans of 250-ft., and five spans of 150-ft. and is 60-ft. in height above normal river level to allow for the great floods which occur during the heavy rains of the north-east monsoon period. It forms a striking object viewed from the river, while from the bridge itself there is a remarkable panorama of river, forest, and mountain, native village and rice field. It has been built on the system already described, and, being free from defect or blemish, is a work of which the engineers are justly proud. Last year saw the completion of a hill railway on the island of Penang, also by the railway construction department. This railway is $1\frac{1}{4}$ mile in length, with grades varying from 1 in 4 to 1 in 2, rising from 100-ft. above sea level to an altitude of 2,400-ft. Transport is by means of cars hauled by a wire rope electrically driven and with a half-way changing station. The journey from the foot of the hill to the summit occupies 18 minutes, and it is anticipated that this little railway will revolutionise life in Penang. It will make it possible to reside on the hill, going and returning from business daily. The temperature on the hill is ideal, and the views are comparable with the most beautiful in the world.

Two other important works were also finished in 1924, but in both cases they were executed by a well-known Westminster firm of contractors under the supervision of consulting engineers. One was the construction of a causeway across the Strait of Johore, which separates the island of Singapore from the mainland of the peninsula. Formerly traffic on the railway was carried on by means of waggon ferries, while passengers left the train and were carried across the Strait in steamers to rejoin the train on the other side. But goods taffic was rapidly reaching the limits of the capacity of the waggon ferries, and some other means of transport became necessary. A causeway, composed of granite rubble, has therefore been built across the Strait. It is 60-ft. in width at the top, in order to carry two lines of railway and a roadway.

A lock has been provided for the passage of craft up and down the Strait. The embankment contains over a million tons of granite rubble, the water in the Strait being ten fathoms deep. The new naval vase site is within a short distance of the causeway on the eastern side. The other large work referred to was the completion of deep-water wharves at Prai, opposite Penang . An electric power station is being erected there by the Penang Municipality, and the cheap power supplied should be an inducement to the erection of factories, for which there are good sites with water, rail, and road access.

A Complete Ribbon

The opening of the Johore causeway made the "ribbon of steel" complete from Singapore to the west bank of the Menam River in Siam. But the city of Bangkok really lies on the east bank, and consequently the Siamese Railway administration is now constructing a bridge over the river in order to carry the southern railway from Singapore right into the heart of the city and into the fine station which hitherto has been the terminus of their northern system. These northern lines, partly metre and partly standard gauge (4-ft. $8\frac{1}{2}$-in.), are all being regularised as metre gauge. At the same time extensions are being made to the French colonies to the eastward, where also there is railway activity, and it should not be many years before the metre gauge railway is continuous from Singapore into China. A connection between Siam and Burma and between Assam and Burma has long been talked of, and various routes have been surveyed.

The headquarters of the Federated Malay States Railway Administration are at Kuala Lumpur, the Federal capital. The staff is housed in a building completed in 1916, immediately outside the station, and together they form a fine architectural group in an Eastern style well suited to the environment. There is an hotel over the station run by the department, and another at Ipoh, the northern industrial capital, where a fine station was built in 1915. The railway workshops are situated about three miles from Kuala Lumpur and cover 150 acres. The shops are well equipped and up to date, employing some 2,000 men. The shop foremen are Europeans, recruited from British railways, but the artisans, fitters, and others are either Chinese, Eurasian Malays, or come from various parts of India. Many of them served their apprenticeship in the shops and have remained on permanently.

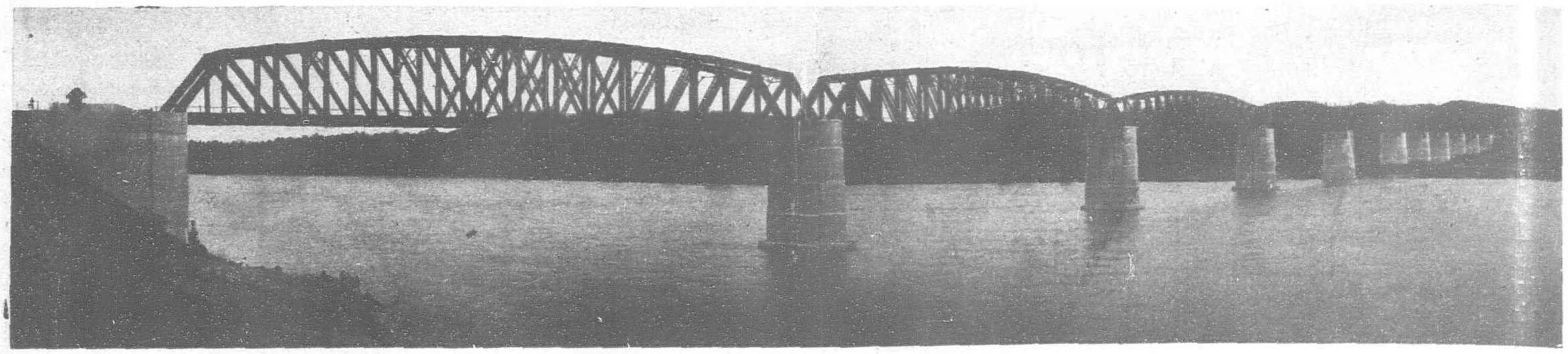
Chinese Coachbuilding Work

As regards the work done in the railway workshops, in locomotive work only repairs are dealt with, new locomotives usually being purchased from British manufacturers. Waggon and coach bodies are built there, in addition, of course, to the usual maintenance repairs. Some very fine coach building work is turned out by Chinese workmen, and compares favorably with the best English work. The coaches are built of local timbers, are well turned out and equipped ; the standard length over all is 60-ft. and the breadth 8-ft. 10-in., which is unusually wide for a metre gauge. A notable model of a sleeping coach with bunks at right angles to the length of the coach, an unusual feature on a metre gauge line, was exhibited in the Malayan Pavilion at the Wembley exhibition. This model was made entirely, down to the smallest detail, by workmen employed in the shops.

The majority of locomotives are of the Pacific type, a general utility engine both for goods and passenger work being found most suited to the character of the traffic. The latest of these have an axle-load of twelve tons. Covered goods waggons, carrying a ten-ton load, with a tare of five to six tons, are the type principally in demand, and are best suited to the climatic conditions, where very few classes of goods can be carried in open trucks protected by sheets owing to the torrential rains. A large number of bogie open waggons are in use for the transport of fuel. These carry-twenty-eight tons, and have a tare of twelve tons. For locomotives the railways use coal supplied by the Malavan collieries. It is a lignite of moderate quality, but as it is cheap to mine it can compete with imported coal and gives reasonably good results. It has replaced the firewood cut from the mangrove forests, which was formerly used. The bulk of the passenger traffic is thirdclass. The number of passenger carried in 1923 was 10 millions, and nearly two million tons of goods and merchandise was transported.

New Type of Fishing Vessel

In Holland a new type of motor coaster has been developed in the past year, being a small ship of about 100-ft. length by 20-ft. beam, and 6-ft. 6-inches depth, fitted with an 80 h.p. heavy oil engine and auxiliary sails. These ships are usually constructed with a continuous trunk of about 24-inches height, with a small hatch opening forward and a larger hatch of about 33-ft. length aft, the engine room and accommodation for the skipper being aft. From the growing number of orders for this type, it appears to yield satisfactory results in service. They are particularly adapted for fishing purposes.



Guillemard Bridge over Kelantan River

The Guillemard Bridge over the Kelantan River

ON July 19th, 1924, H.E. the Governor of Straits Settlements and High Commissioner, Federated Malay States, Sir Laurence Nunns Guillemard, K.C.B., K.C.M.G., officially opened the bridge over the Kelantan River near Tanah Merah, Kelantan, which has been called Guillemard Bridge to commemorate his period of governorship.

The bridge is situated about 35 miles from Tumpat, the terminus of the Railway in Kelantan which line when linked up with the line in Pahang will form the East Coast line, giving through connection between Singapore and the Siamese lines. The western line *via* Kuala Lumpur, Penang and Kedah has been open for through traffic with Siam since 1918. The Pahang-Kelantan line was commenced in 1912 but the work has been subject to interruptions. From 1914 to 1918 work was completely stopped on account of the war and from 1921 till 1924 it was considerably slowed down on account of the financial situation. The work is now being pushed on vigorously over the whole length and it is hoped that the line will be completed by the end of 1927. The total length from Kuala Lipis in Pahang to Tumpat in Kelantan is 187 miles, and of this length 23 miles have been opened for traffic in Pahang and 53 miles in Kelantan.

The Guillemard Bridge is by far the largest bridge in the Malay Peninsula and is 2,166-ft. long over all, being composed of five clear spans of 250-ft. and 5 spans of 150-ft.

The height from the river bed to the under side of girders is 55-ft.

The Kelantan river at the bridge site has a normal low water width of 1,100-ft. but in the N.E. Monsoon it is subject to floods of 30 to 35-ft. above the normal level, and the width increases to over 2,000-ft.

The bridge was commenced in 1920 and completed in 1924 but on account of financial circumstances progress was slowed down over a considerable portion of this period.

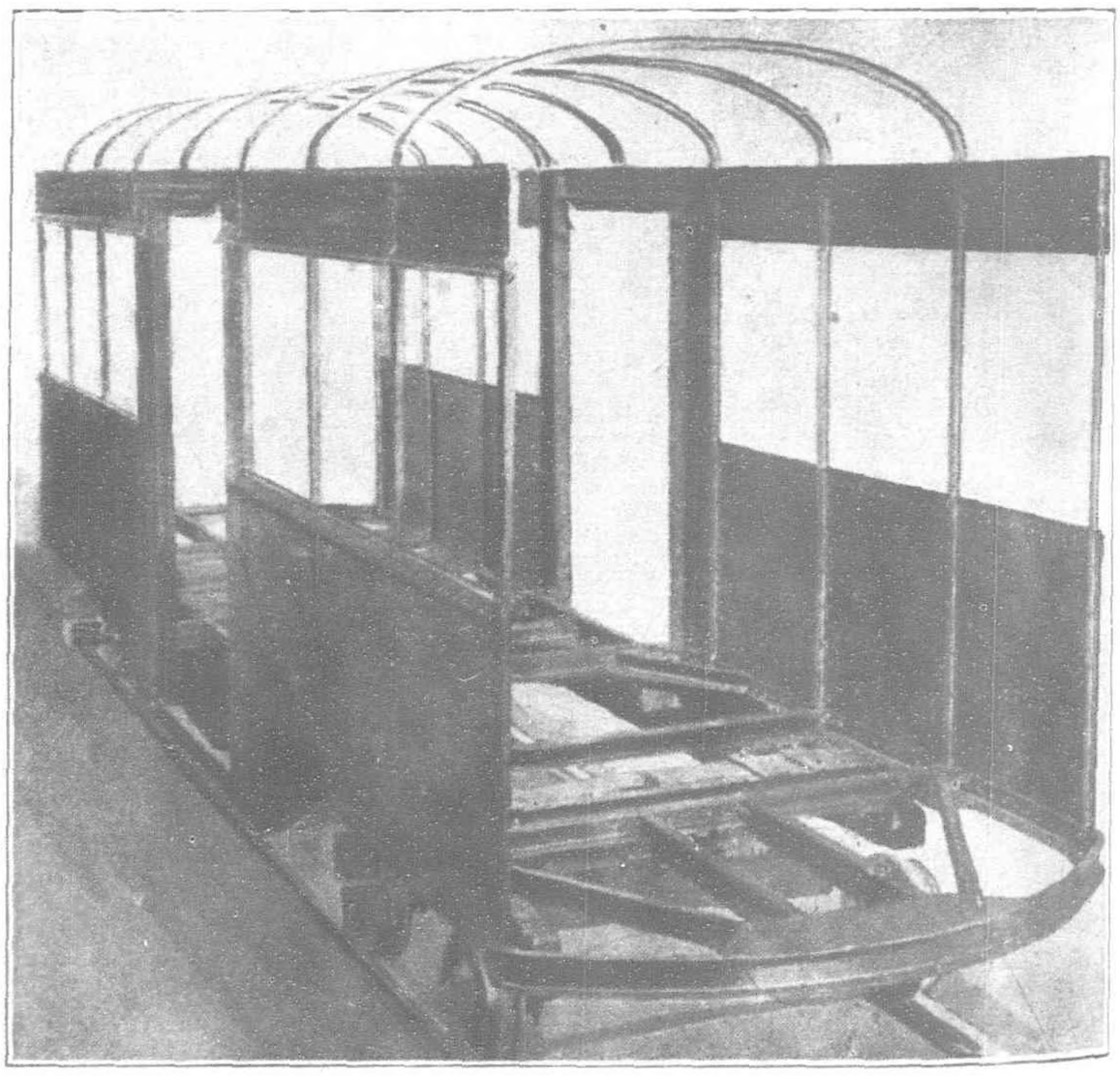
The two abutments are founded on 4-15 foot diameter wells and 2-12 foot diameter wells. Three river piers are founded on 41′ by 20′ circular ended wells and 6 piers on 2-18 foot diameter wells. The greatest depth of wells below river bed is 57-ft., and a good foundation was obtained on hard shale. The wells which are of concrete were sunk where possible in the dry, and by grabbing when the water could not be pumped out, additional concrete being added to the wells as the work of sinking proceeded. No serious difficulties were encountered in the sinking. On completion of sinking the bottoms of the wells were sealed by a diver when the water could not be pumped out, and the wells filled up with concrete.

The work of building of the piers and erection of steelworks presented no difficulty save that the seasons when the river is liable to floods, which are fairly regular, had to be watched.

The quantity of concrete and brickwork in abutments and piers is about 20,000 cu. yds., and the total weight of steelwork in the girders is 2,776 tons. The design and construction of the piers and abutments of the bridge and the erection of the steelwork were carried out by the Construction Department of the Federated Malay States Railways and the steelwork was supplied by the Metropolitan Carriage Wagon and Finance Co., Ltd., Old Park Works, Wednesbury, through the Crown Agents for the Colonies.

Steel Frame and Brill 79-E Trucks for Shanghai, China

A unique and most interesting shipment was made from the Philadelphia plant when, following the dispatch of ten Brill 79-E Trucks, a skeleton steel frame for a single-truck centre-entrance. This type car was built up, dismantled in sections, and boxed for ocean transport to Shanghai Electric Construction Company, Ltd., China.



Steel Frame for Shanghai

This company, which operates the concession for electric tramways in the International Settlement of Shanghai, is equipped for the construction of wooden carbodies and, following the modern tendency toward steel-frame bodies of light-weight construction, purchased the frame illustrated which was designed and fabricated in such a manner to facilitate the quick and satisfactory reassembly of the sections upon arrival at destination.

The Yungan Hydro-Electric Light

By J. E. Skinner

ABOUT four years ago, after many and lengthy discussions, arrangements were made and a contract drawn up which would have put in a hydro-electric plant for Yenping City when General Wang Hing-chang threw his monkey wrench into the wheels and the whole project fell through.

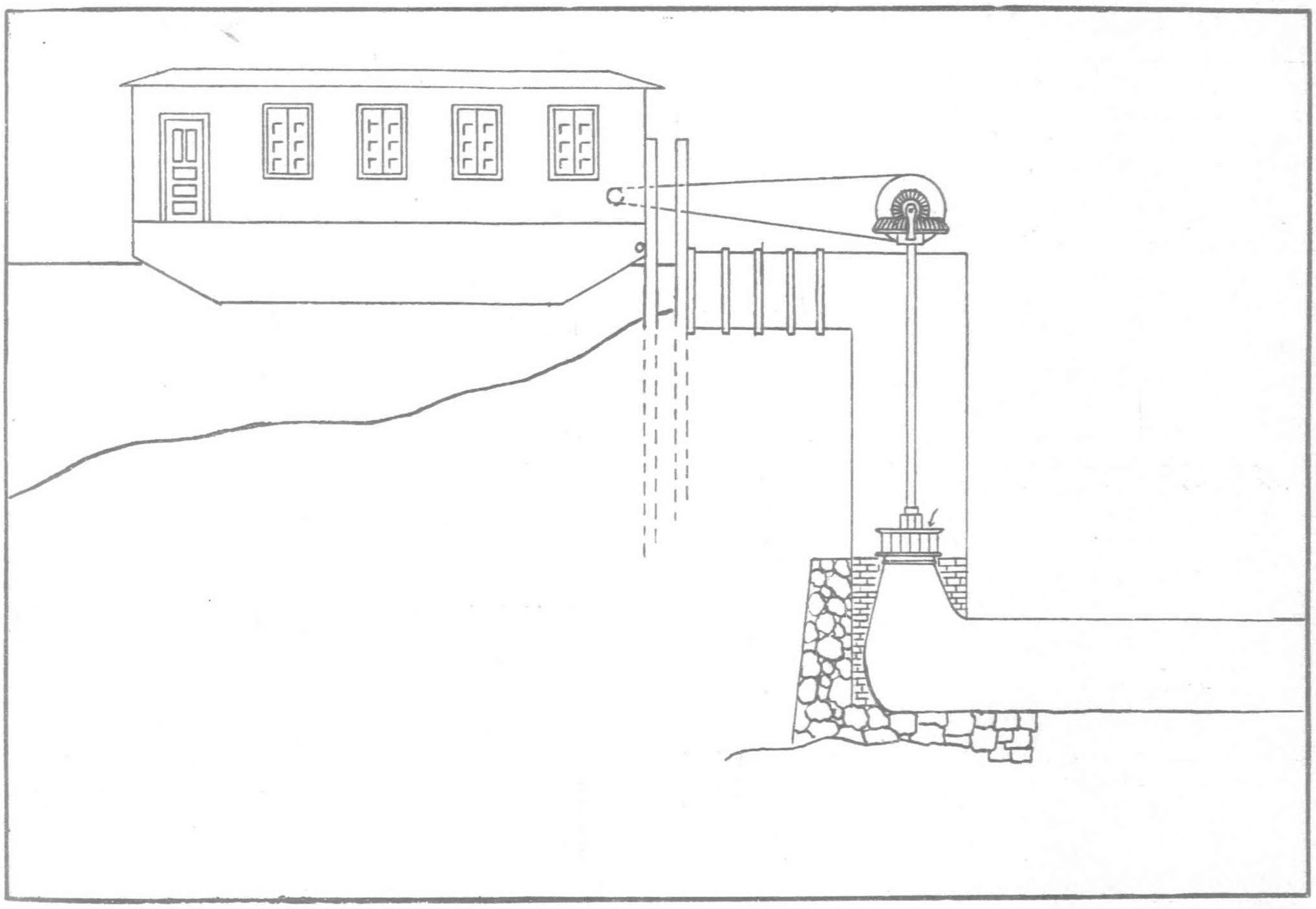
Then we moved to the city of Yungan, nearly a hundred miles farther inland, where also there had been talk of such an undertaking. Here, in the summer of 1923, a company was organized and shares sold.

It was proposed to utilize a navigable little stream which joined the main river right at the city. A low dam, of ancient make, had been thrown across it a short distance above the mouth, and we were given a share in the use of the mill race and site. The dam had to be repaired, strengthened, and raised about a foot to give us ten feet head. From the power site to the centre of the city was only 2,300-ft.

It was nearly a year before the shipment reached Foochow, and meanwhile the political situation had completely changed. A good number of our shareholders had been driven out of the country and were unable to meet their payments. In the darkest hour the American-Oriental Bank of Fukien came to our aid with a loan on very generous terms and enabled us to carry on.

In addition to the political troubles a part of our dam was washed out by the unusual floods of last summer, and this required considerable time and money to repair.

In June I went to Foochow to bring up the machinery which had been waiting there for over a month already. I arrived in just the nick of time, for the generator had been left on the Bund, and a big flood was reported by telegraph as on the way down river. A hard half day's work raised it high enough so that the flood, the highest in many years, only reached its base. It would have been completely covered, and perhaps ruined, by that muddy water had it been left down.



The Lay-Out of the Plant

The stream runs through an alluvial plain, and the main dam, nowhere over three or four feet high, is simply built on coarse gravel. To support the timbers we made use of the common Chinese method of heavy cribs, about four by eight feet in size, filled with boulders.

The next problem was where to place the generator, as once in a long time all this part of the valley is inundated to the depth of eighteen or twenty feet, or more. It was finally decided to place it on a big houseboat in the forebay. The plan was referred to competent engineers at home, who promptly sat down on it, but as no other way seemed practicable we went ahead, and now after a two months trial we can say it appears to be working well.

In the fall of 1923 we sent G.$3,000 to Mr. E. F. Black, of the Fukien Construction Bureau, and it is to him that much of the success of the whole enterprise is due. He very kindly planned the purchase in America of a 25 K.V.A., 480V. generator, 3 phase, 60 cycle, Crocker Wheeler make. The water turbine is a 36-inch wheel, made by the Fitz Water Wheel Co. of Hanover, Pa.

It is no easy matter, under the most favorable conditions, to arrange for the transport of such heavy freight so far inland, and there was much trouble and delay before it was all loaded on to two boats rated at 10,000 lbs. capacity each. The water-wheel was all taken to pieces, which made that much easier to handle, but when the 1,800 lb. generator went down into the bottom of the boat I feared the bottom would give way.

The trip of two weeks up the Min rapids was unusually uneventful, we neither bumped a rock not saw a bandit, though boats both ahead and behind us were held up, and our own boats on the return trip to Foochow suffered a serious wreck.

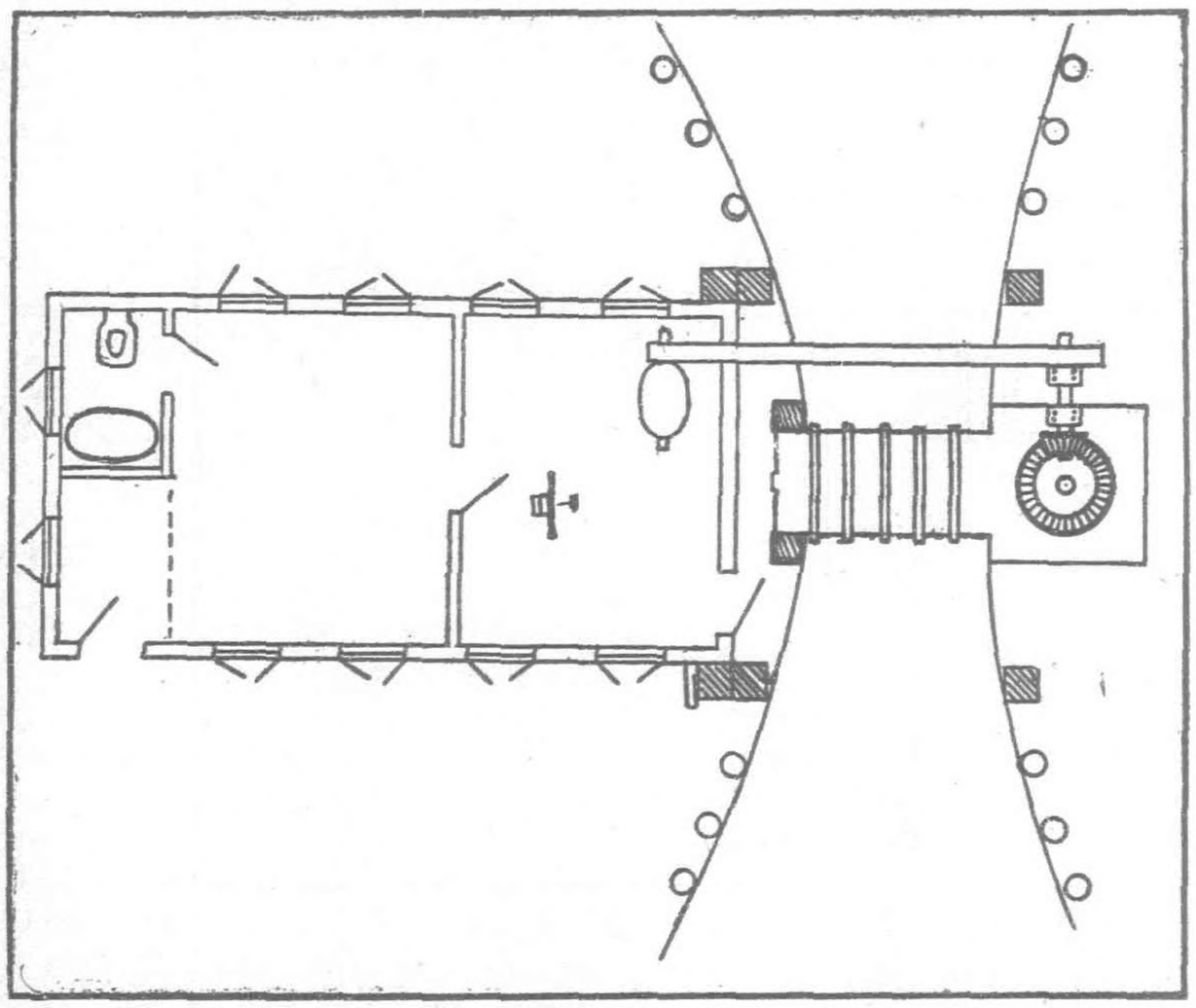
Reaching Yungan City the generator was lifted out and slid down poles to the bank. That very night didn't a sudden freshet come along and completely cover it! Fortunately the water was not at all dirty and the next day we hauled it up out of the river and carried it to the shop where it reated all summer, giving it a good chance to dry.

Meanwhile, poles were being erected, repairs on the dam completed, and wires strung along the principal streets.

Our Chinese staff was composed of two ex-teachers, now treasurer and secretary, a third teacher acting as machinist, whose theoretical knowledge was extremely limited and whose experience was about nil, and two line men, one of whom had the good luck to work for about two weeks with Mr. R. H. Steininger, the Yenping representative of the Fukien Construction Bureau.

Never having the least experience in handling electrical machinery I was myself fortunate in having the opportunity last summer to assist Mr. Steininger install the small, oil-burning mission plant in Yenping. We are also very deeply indebted to him for his expert advice, and kind assistance in purchasing wire, lamps, and other accessories from firms in Shanghai.

By December we had the turbine in place and running, and the boat usable. We did not wait for all the finishing touches but placed the generator, excitor, and switchboard, joined up to the main line and started. The political situation had again changed with the return to power of those who had been helping finance the project at the start. The victorious General Lu had never seen any kind of electric lights and he drove us up to start them before we were really ready, so he could feast his eyes upon them before he had to return to Yuki. He was so delighted that, before leaving, he said, " Come to Yuki and put a plant there. The money will be waiting for you."



Cross-Section of Plant

We found on unpacking the transformers that several had been badly damaged in transit. We patched them up and put them in place, and then found the iron pins for the insulators had been left in Foochow by mistake, so we ran our lines setting some insulators on spikes, elsewhere using ordinary porcelain knobs. Anything to quickly get light into the shops.

Oil was selling at $7 a tin, and often not available at all. Occasionally we would have a short circuit, and have to shut down until the fault could be located and remedied. Once I thought we were done for, as one of the bearings on the generator got hot and stuck fast! I had never taken such a machine to pieces, but we went at it, and finally by sawing through the bearing managed to free it. It has given trouble since.

We are now completing the wire installation, and hope soon to have the city fairly well illuminated. Judging by the present clamor for lights we may expect the total capacity of the plant to be utilized at an early date.

People are coming from long distances to see the magic of water being changed into light, and letters are coming from other places asking for information, and requesting me to buy the machinnery for them.

With water-power as convenient and abundant as it is all over Fukien there is no reason, except the political one, why it should not be widely utilized, and I am sure this is only a small beginning of an important development of such enterprises.